ANNALS

OF THE

ROYAL BOTANIC GARDEN, CALCUTTA.

Vol. VII.

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BAMBUSEÆ OF BRITISH INDIA.

By

J. S. GAMBLE, M.A., F.L.S.,

Conservator of Forests, School Circle, and Director of the Imperial Forest School, Dehra Dun.

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WITH ONE HUNDRED AND NINETEEN PLATES.

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ERRATA.

Page 2, line 8, from below, after '2' *omit* ','
,, 21, ,, 1, *for* '(Lepcha' *read* '(Lepcha).'
,, 29, ,, 16, *for* '*aruhemica*' *read* '*arnhemica*.'
,, 48, ,, 28, *for* '*Fl.*' *read* '*Fl.*'
,, 62, ,, 28, *for* '*verticiliata*' *read* '*verticillata*.'
,, 62, ,, 31, *for* 'lodicules and anthers' *read* 'lodicule and anther.'
,, 62, ,, 32, *before* 'Royal' *add* 'the.'
,, 70, ,, 3, from below, *for* 'hirsute apiculate' *read* 'hirsute-apiculate.'
,, 74, ,, 12, from below, *for* 'Proc.' *read* 'Journ.' and *for* '232' *read* '252.'
,, 93, ,, 9, from below, *after* 'leaves' insert 'not.'
,, 93, ,, 5, from below, *for* 'pbbescent' *read* 'pubescent.'
,, 119, ,, 7, from below, *for* 'eastern' *read* 'western.'
,, 121, ,, 9, *for* '*longispiculata*' *read* '*tenuispiculata*.'
,, 122, ,, 11, from below, *for* '50 to 60' *read* '50 or 60.'
,, 110 ,, 20 from below, for Kurz in Journ. As. Soc. Beng. X/ii, 300 read Kurz Mss. in Herb. Calcutta.

INTRODUCTION.

THE tribe of the BAMBUSEÆ is a section of the great natural order GRAMINEÆ, the grasses, and is especially remarkable by containing those large tree-like members of the family which are so characteristic of the tropical regions of the globe and so useful to man in the localities where they are found. From the earliest times, travellers have been struck with the beauty and importance of the members of the tribe. Ruprecht in his Monograph, published in 1839, says that the first mentions of bamboos occur in the works of Ctesius, in the letter from Alexander the Great to Aristotle, and in the Natural History of Pliny. After that a considerable blank occurs, so that the next references are to be found in the works of Lobelius (1571), Clusius (1601), Garcia (1605), Marcgrave (1648), Piso (1658), C. Bauhin (1671), van Rheede (1678), Pluckenet (1696), Kaempfer (1712), J. Burmann (1737), etc., although in most cases it is difficult to say what species are referred to. The first writer on Indian bamboos was van Rheede, who in his "Hortus Malabaricus" described and figured two kinds which we now identify as the species *Bambusa arundinacea* and *Ochlandra Rheedii.* Pluckenet in his "Almagestum botanicum" refers to these two again as "Arundo arborea, *Mambu* vel *Bambu* dicta" and "Arundo arborea, *Bambu* species altera," and gives a third "Arundo arbor indica procera *mungell* dicta." In 1750 appeared the "Herbarium Amboinense" of Rumphius, who divided the bamboos known to him into eight classes, viz.—

1.	Arundo	Arbor	tenuis,	*Leleba.*
2.	"	"	Cratium,	*Bulu seru.*
3.	"	"	spiculorum,	" *tuy.*
4.	"	"	Vasaria,	" *jara.*
5.	"	"	aspera,	" *potong.*
6.	"	"	maxima,	" *sammat.*
7.	"	"	spinosa,	" *baduri.*
8.	"	"	fera,	" *swangi.*

and these classes again into various kinds; so that, for instance, the first class was subdivided into six, viz.—*Leleba alba, nigra, prava, picta, lineata, amahussana.* The identification of Rumphius' bamboos has afforded work for several botanists, as, for instance, Schultes in 1830, and Miquel in 1855; but it is hardly worth while here to give the results, for most of the species mentioned do not belong to the region to which the present work relates but rather to that of the great Malay Archipelago.

In the first edition of the "Species Plantarum" of Linnæus, 1753, one species is given under the name *Arundo Bambos.* There is no doubt but that several species were referred to under that name, the chief and principal one being the common *Bambusa arundinacea.*

In 1814 appeared the "Hortus Bengalensis" of Dr. W. Roxburgh, Superintendent of the Company's Garden, now the Royal Botanic Garden, Calcutta, in which list were enumerated seven species under the names *Bambusa arundinacea, stricta, Tulda, Balcooa, baccifera, spinosa, nana,* which were afterwards described in the author's "Flora Indica." These form six of the species described in this work.

In 1839 appeared the admirable monograph of Dr. F. J. Ruprecht, published first of all in the proceedings of the Imperial Academy of St. Petersburg, and afterwards as a separate work. In this, about 18 species were described from the Indo-Malayan region, corresponding to about 12 of those herein described. Then came, in 1866, the "Monograph of the Bambusaceæ," by Colonel Munro, C.B., published in the "Transactions of the Linnean Society, Vol. XXVI," which is the foundation of our modern knowledge of bamboos. In that work were published descriptions of Indo-Malayan species corresponding to about 70 of those herein given. Arranged in genera, Munro's Monograph described of Indo-Malayan species about 70 altogether, allowing for those which have been herein reduced.

Genus.		Fully known.	Partly known.	Doubtful.	Total.
Arundinaria	...	10	5	...	15
Thamnocalamus	...	2	...	...	2
Phyllostachys	...	1	...	...	1
Bambusa	...	17	7	3	27
Gigantochloa	...	2	...	...	2
Oxytenanthera	...	4	...	...	4
Melocanna	...	4	...	...	4
Schizostachyum	...	1	...	...	1
Cephalostachyum	...	3	...	...	3
Pseudostachyum	...	1	...	...	1
Teinostachyum	...	2	...	...	2
Beesha	...	2	...	...	2
Dendrocalamus	...	8	...	...	8
Dinochloa	...	1	...	...	1
Total	...	58	12	3	73

The "Flora Sylvatica" of Madras, by Colonel R. H. Beddome, described 18 species as indigenous in Southern India, and of these 16 are admitted; while the "Forest Flora of British Burma," by S. Kurz, which appeared in 1878, included 30 species of that country. In the present work, 115 species are described, making a considerable addition to those known to Munro; but this number is by no means the end; for there exist in Upper Assam, Upper Burma, Tenasserim, the Malay States, and even in South India also, several species which are known either only by the

collection of a few leaves or by report, and these will require to be described later on as material for the purpose becomes available.

The subdivision of the *Bambuseæ* into sections and genera adopted in this work is that of the "Genera Plantarum" of Bentham and Hooker. Of the 22 genera given in that work, 14 belong to the Indo-Malayan region, the rest being chiefly American.* In the following pages, only one new genus has been described, *Thyrsostachys*, so that we have 15 genera in all. In Engler and Prantl's "Die Naturlichen pflanzenfamilien," now under publication, 23 genera are given. This is accounted for by the authors having placed *Guadua* under *Bambusa*, and by their having added two new genera founded by Franchet for West African species (*Atractocarpa* and *Puelia*). The most recently published work on the genera is Baillon's "Histoire des Plantes," Volume XII, 1894, in which 28 genera are admitted, the new ones being *Guaduella*, *Microcalamus* (West Africa), *Glaziophyton* (South America), *Fargesia* (China), while *Guadua* is restored to generic rank.

The distribution of bamboos depends upon climate. They are found more or less in all tropical and semi-tropical regions, but especially in Asia and in South America. In Europe there are none. In Asia they extend through India, Burma, the Malay Peninsula and Archipelago to China and Japan. In Australia there are (so Baron Von Mueller, K.C.M.G., the Government Botanist in Victoria, informs me) four species, one only of which (*Bambusa Arnhemica*, F. von Muell.) has yet been described; and there is one in New Caledonia. In Africa there are species of *Oxytenanthera* in Abyssinia and East Africa, of *Nastus* in the Mascarene Islands, and of four new genera in West Africa, while South Africa has only one species. In America there are many species, but of genera distinct from those of Asia.

The descriptions given herein have been drawn up on the advice of Dr. G. King, as nearly as possible on a uniform system, giving, in regular order, the characteristics of the chief organs. And here it may be as well to give a few remarks on these characteristics.

The CULMS or stems of all bamboos are more or less cylindrical, hollow in the interior, and separated by partitions into joints. The partitions are called *nodes*, and the portions between them are called *internodes*. In almost all the Indian bamboos, the culms are cylindrical, but in some species there is a slight tendency to angularity, as, for instance, in *Dinochloa McClellandi*, which has the joints arranged in zig-zag fashion, and the younger culms faintly quadrangular. In the species of *Phyllostachys* and in *Bambusa arundinacea*, the internodes are often grooved or flattened on one side. But in none of the Indian species is there anything like the marked angularity which is met with in the "square bamboo" of China, known at present by the name *Bambusa quadrangularis*, Fenzi (see article on "The square bamboo," by W. T. Thiselton-Dyer in "Nature" for August 27th, 1885, p. 391). In some Indian species the cavities of the culms are almost, if not quite, absent. This is especially the case with a certain number of culms in each clump

* ARUNDINARIEÆ. *Arthrostylidium*, *Athroostachys*, *Merostachys*, *Chusquea*, and *Planotia*; all American.
BAMBUSEÆ. *Nastus*—Réunion; *Guadua*—America; and *Greslania*—New Caledonia.

in the common "Male bamboo" (*Dendrocalamus strictus*) when it is found growing in a suitable dry locality and on poor soil, as for instance in the Siwalik Hills near Hardwar. In *Arundinaria Prainii*, a very thin wiry climbing species, the culms are usually, if not always, solid. The nodes of the culms of bamboos are always prominent, some, however, less so than others; the lower ones frequently bear root scars or curved thick stiff rootlets surrounding them as a fringe. These roots sometimes develop and enter the ground, but very often they dry up and leave prominent scars or projecting stumps. Some bamboos have their nodes shaggy with circles of hair, in some the nodes broaden out (as in *Dendrocalamus patellaris*) into flattish plates; while some again are furnished with a ring of more or less formidable spines. Such spines occur in *Arundinaria callosa* and *Griffithiana* and in *Dinochloa Tjangkorreh;* and in these species they seem to be due more to arrested rootlets than is the case with the spines of *Bambusa arundinacea* and *B. Blumeana*, which are only borne on branches, and not on the main culm, and which are attached only on one side, where they are obviously caused by arrested buds which may or may not afterwards develop into branchlets. None of these species, however, have the spines of any great length, nothing like those of a species which is said to occur on the hills between Burma and Assam, and to bear at its nodes spines between 4 and 6 inches long and very sharp, so that to penetrate the thickets must be a work of considerable danger even to wild animals accustomed to the jungles. Usually the knots cross the culms at right angles, but occasionally specimens are found with the knots united into a spiral. (See *Kurz Ind. Forester*, I. 252, plate 1, figure 2.) This is especially the case with *Melocanna bambusoides*. In size, the culms of bamboos are very variable, and range from the gigantic culm of *Dendrocalamus giganteus*, which often reaches 100 to 120 feet in length, with a diameter of 8 to 10 inches, down to those of the little *Arundinaria densifolia*, which is hardly 3 feet high at most, with diameter of $\frac{1}{3}$ inch. Between these limits almost every possible size may be met with, though of course in some of the climbing species the length of culm may frequently be greater than even the 100 feet of the giant "*Wabo*." The internodes of bamboos vary in character as much as the nodes, chiefly in colour, or in amount of pubescence. Most of them are green in colour, of various shades, some tending to white when covered with waxy scurf, some to brown or grey when furnished with thick appressed spicules (*e.g.*, the felted culms of *Bambusa polymorpha* or the velvety ones of *Oxytenanthera monostigma*), and some, as in a variety of *Bambusa vulgaris*, to yellow with green stripes. In *Bambusa affinis* and *Gigantochloa verticillata* the internodes are striped with pale green and white. In length, too, the internodes vary much, the longest being probably those of *Teinostachyum Helferi*, which have been known to reach 52 inches.

Before completing my remarks upon the culms of bamboos, it is necessary to mention the substance "tabasheer," which is a "silicious whitish floury substance, which "is found as a secretion, or more probably as a residuum, in the interior of the joints "of several species (especially *Bambusa arundinacea*), often up to an inch in thickness" (*Kurz in Ind. Forester*, I. 239). This substance has been much discussed from the

very earliest times, and it is considered in China and elsewhere to be a valuable medicine. For an account of it, it will be best for those who are interested in the subject to refer to various works, and especially to the article "Bamboo" in Dr. G. Watt's "Dictionary of the Economic Products of India," vol. I; to the account given at vol. III, p. 587, of the "Pharmacographia Indica," of Messrs. Dymock, Warden and Hooper; and to a paper by Sir D. Brandis, in "Ind. Forester XIII, 107."

The RHIZOMES of bamboos are of two kinds: (1) those with cæspitose culms, in which the rhizomes are short, knotty, thick, solid growths which form an entangled network below (or occasionally pushed up above) the surface of the soil, and from which, as they grow, are thrown out the buds which develop into culms; (2) those with distant culms, in which case the rhizome pushes its way underground and sends out at intervals rootlets into the soil and buds from which the culms arise singly. Most of the Indian bamboos belong to the first section, and of this *Dendrocalamus strictus* and *Bambusa arundinacea* may be taken as types. The most characteristic bamboo of the second section is *Melocanna bambusoides*, whose long rhizomes have the power of spreading so far and so quickly that vacant spaces in the hills where the bamboo occurs can be covered with culms in an incredibly short space of time. The species of *Phyllostachys* seem to have all this habit of growth, and two of the newly-described *Arundinarias*, *A. Jaunsarensis* and *A. Rolloana*, as also *A. racemosa*, are particularly remarkable for their power of spreading. The length of the rhizome of *A. Jaunsarensis* between culms often reaches as much as 3 feet, and the rhizomes of this and of *A. racemosa* make good flexible riding canes. Bamboos with long rhizomes near the surface of the soil are very easy to propagate, for at the base of each sucker are buds which are capable of developing. In those with cæspitose culms the rhizomes are much shorter, and the detachment of portions fit for propagation is not so easy, though it is quite feasible and usually successful if a portion of rhizome furnished with good buds and with the roots intact is removed. The new culms usually develop with the beginning of the rainy season, and it is noticeable that whichever is the chief rainy season in any part of India, that season is the one for the new culms to come up. In Northern India both *Bambusa arundinacea* and *Dendrocalamus strictus* send up their new culms in June or July, when the south-west monsoon begins; but in South India, as may be excellently seen on the eastern slopes of the Nilgiris (*e.g.*, in the Coonoor Valley) the new culms appear in September or October, probably with the first burst of the north-east monsoon rains.

When the young culm-bud first begins to develop, a conical growth is seen protruding from the ground, covered with imbricating sheaths, often of a bright colour and furnished with blades. Gradually, the cone lengthens, the sheaths separate, the nodes appear, and in a greater or less time, according to locality and climate, a full culm is produced. Then usually, one by one, the sheaths drop off, the buds at the nodes put out branches, and these produce their leaves. Kurz in "Bamboo and its use" gives an account of observations taken in Calcutta, under the superintendence of Dr. Wallich, which shewed that a culm of *Dendrocalamus giganteus* grew 25 feet 9 inches in 31 days, and one of *Bambusa Balcooa* 12 feet, ½ inch in 23 days;

while shoots of *Bambusa Tulda*, according to Roxburgh, rise to their full size of from 20 to 70 feet in height in about 30 days. The CULM-SHEATHS, to which we have referred as surrounding the young shoots, are very interesting, for they are almost always of shapes which are characteristic of the species to which they belong. In regard to this, Munro says:—"The spathes or large sheaths which cover the nodes "or lower portions of all bamboos vary much in size and appearance, and will, I "think, afford good characters when they are more studied and better known. "Dr. Brandis has paid considerable attention to this subject; but these sheaths do "not appear in general to have attracted the notice of collectors." Kurz, too, held strongly the opinion that these culm-sheaths were very important in classification, and his collection of drawings of culm-sheaths, deposited in the Herbarium of the Royal Botanic Garden, Calcutta, has proved of great service to me. Thanks to the exertions of many friends and to the facilities for collection I have myself enjoyed, there are not many species herein described of which the sheaths are unknown; and a glance at the drawings of them, and, still better, at the Herbarium sheets, will show that almost all have some definite characteristic which is sufficient in the absence of the flowers to identify the species. Culm-sheaths have three principal parts. The *first* part, the sheath proper, corresponding to the petiole of ordinary leaves, appears in bamboos as a broad expansion with its base attached at the node of the culm. Sometimes the sheath is very thin and papery, as in most *Arundinariae;* sometimes it is thick and smooth, as in most *Dendrocalami* and *Bambusæ;* and sometimes it is coriaceous in texture, as in *Dinochloa* and *Oxytenanthera Bourdilloni.* In regard to clothing, some species (*e.g.*, *Dendrocalamus sikkimensis*) have a dense felted mat of brittle stiff hairs all over the outer surface, and from this down to the nearly glabrous sheath of *Dendrocalamus giganteus* there is almost every gradation. The *second* part is the "imperfect blade," corresponding to the blade of a leaf, and is inserted on the top of the sheath, where it takes many forms and shapes, and frequently is decurrent into "auricles," which often are fringed in various ways with stiff bristles. In most species of *Arundinaria*, *Phyllostachys*, *Thyrsostachys*, *Oxytenanthera*, *Dendrocalamus*, *Melocanna*, and *Teinostachyum* the imperfect blade is narrow, frequently recurved and long; while in *Bambusa*, *Gigantochloa*, *Dinochloa*, and some species of *Cephalostachyum* it is broad, triangular and much decurrent. The blade of *Bambusa khasiana* is swollen out and inflated, while in *Ochlandra setigera* it is scarcely more than a fine needle-like point. The *third* part is the *ligule*, inserted, as in the leaves of all grasses, on the inner surface at the junction of the sheath and blade. There is, of course, in all parts, as Kurz has pointed out, a good deal of difference in size and shape, according as the sheath is taken from the base, the middle, or the top of a culm, or from a side branch; but a little study and experience soon teaches us to recognize the general characters. Almost the only cases I know of in which the culm-sheath fails to yield a distinguishing character are *Bambusa Tulda*, *B. nutans*, *B. teres* and *Gigantochloa macrostachya*, in which four species the culm-sheaths are very similar in appearance.

The LEAVES of all bamboos are very similar in general appearance, for, although some species have usually large leaves and others quite small leaves, the size depends much on the part of the plant from which they are taken. Thus, in *Dendrocalamus Hamiltonii*, the leaves of young shoots and the end leaves of strong branches are usually very large, while those of medium branches are moderate in size and those of thin shoots from lower nodes are quite small. In respect to determination therefore, as Kurz says, "little value can be attached to the size, shape and "nervature of bamboo leaves." Bamboo leaves are usually linear, lanceolate or oblong-lanceolate in shape; they have usually a short petiole into which the base, which is frequently unequally cut, extends; the point is usually long acuminate, often scabrous, sometimes shaggy (*Bambusa khasiana* and *B. marginata*); the edges are often scabrous; the sides glabrous or softly hairy and the veins parallel and prominent. I have described these veins as they are usually seen: *first* a midrib or main vein usually thick; *secondly* a number or pairs of secondary veins easily seen with the naked eye; and *thirdly* a number of intermediate veins, usually 5 to 7, for seeing which a lens is required. Then there are *fourthly* the transverse veinlets, and here I wish to note that, so far as my own observation goes, true transverse veinlets occur only in the genera *Arundinaria* and *Phyllostachys*; in others, what appear to be transverse veinlets are not really such, but are caused by glands which in fresh specimens are seen through the leaf as pellucid dots and in dry specimens as raised lines, giving the appearance of cross bars between two neighbouring intermediate veins. At the base of each leaf, below the petiole, come the "leaf-sheaths" and "ligules"; both often giving good characters for the identification of species; for the leaf-sheaths are often furnished with ciliæ or bristles and small auricles of various shapes, and the ligules may be of different degrees of prominence, those of *Ochlandra Brandisii* and *Gigantochloa ligulata* being especially long.

In regard to INFLORESCENCE, there is great variation among bamboos; sometimes the spikelets appear on leafy branches, sometimes in gigantic panicles covering a whole culm; sometimes the spikelets are very few and scanty, sometimes they are extremely numerous; sometimes they are distant on the branches of the inflorescence, sometimes congested into large rounded heads. The inflorescence is made up of spikelets with or without bracts. These spikelets vary much in the number and arrangement of the flowers, but they all contain (I) *empty glumes*, usually two, sometimes more, sometimes fewer; then a variable number of flowers, of which the lowest and the last may often be empty, but consisting of (2) a *flowering glume*, generally similar to the empty glumes; (3) a *palea* which is usually keeled or convolute and embraces (4) the *lodicules* which vary in number, being sometimes absent, as in most *Dendrocalami*, sometimes very many, as in *Ochlandra*, but usually three in number as in most genera: (5) the *stamens* which are three in number (as in most *Arundinarieæ*), six (as in *Eubambuseæ*, *Dendrocalameæ* and most genera of *Melocanneæ*), or many (as in most species of *Ochlandra*, one of which may have as many as 120); and (6) the *ovary*, surmounted by the style and stigmas. In all these parts there is considerable variation, and indeed in the

same genus we may see great variation in the size, length and number of flowers borne by a spikelet. Thus, in the genus *Arundinaria*, the spikelets of *A. callosa* may be 2 to 3 inches long with 6 to 12 flowers, while in *A. densifolia* they reach barely half an inch in length with only one flower. Of all the parts of the flower, the best characters for classification purposes are given by the paleas, which are usually boat-shaped, rounded or pointed or cleft at the apex, 2-keeled or not, with or without ciliæ on the keels, and variously veined between the keels and on either side. The lodicules often give good characters; when fresh they are often fleshy, when dry thin and membranous, and they may be variously pointed, ciliate, and veined.

The FRUIT of bamboos is a caryopsis, which usually resembles those of other sections of grasses, but which sometimes has interesting and peculiar characters of its own. In the *Arundinarieæ* and *Eubambuseæ* the pericarp is thin and adnate to the seed, and the caryopsis is small, more or less resembling a grain of wheat or barley. In the *Dendrocalameæ* and *Melocanneæ* the seed is surrounded by a separable pericarp, which is crustaceous in some genera, thick and tough in *Melocalamus* (in which genus the fruit is large, reaching a diameter of 1 to $1\frac{1}{2}$ inches), and large and fleshy in *Melocanna* and *Ochlandra*. In *Melocanna bambusoides* the fruit is large and pear-shaped, often reaching 3 to 5 inches in length and 2 to 3 inches in breadth; while in *Ochlandra travancorica* it is often 4 inches long (including the stiff conical beak).

It is only in a few species of bamboo (*e.g.*, *Arundinaria Wightiana*, *Bambusa lineata* and *Ochlandra stridula*) that flowering takes place annually; in most cases flowering seasons come only at long intervals, and then the whole of the clumps of one species in a given locality flower gregariously and die down after flowering and giving seed. Even in those kinds which may be found occasionally in flower sporadically (*e.g.*, *Dendrocalamus strictus* and *D. Hamiltonii*) general flowerings also take place, and at these the seed produced is usually good, while that given in the sporadic flowering is often poor and of small quantity. All the information which it has been possible to collect has been given under the various species concerned; but it may here be noted that the information is still incomplete, and many more observations will have to be made and recorded before we can begin to predict the flowering times of most of the species. It is owing to the long period which elapses between flowerings that our knowledge of the flowers of bamboos is still so imperfect, and that there are still so many species of which the flowers and fruit, and consequently the real position in the systematic arrangement, are unknown.

The distribution of bamboos in India naturally follows the distribution of the rainfall. In the following table is recorded the list of the bamboos herein described, with their distribution according to the seven principal regions, viz.

(1) North-Western India—including Bihar, the North-Western Provinces, Oudh, the Punjab, Rajputana, and the Himalaya from Nepal westwards.

(2) Central India and the Deccan—including the Central Provinces, Central India States, Chota Nagpur, Orissa, the Northern Circars, Hyderabad, the Bombay Deccan, the Ceded Districts, Mysore, and the Carnatic.

(3) Western Gháts and the Coast—including the Concan, Kanara, Malabar, Travancore, and the Hill Ranges of the Gháts.

(4) Ceylon.

(5) Bengal, N. E. Himalaya and Assam—including Lower Bengal, Sikkim and Bhutan, Assam, Manipur, Tippera and Chittagong, with the adjoining Hill Ranges to the water-parting west of the Irawadi.

(6) Burma—including Upper Burma and its Hill Ranges, Pegu, Arracan, and Upper Tenasserim.

(7) Malaya—including Lower Tenasserim, the Malay Peninsula and States down to Singapore and the Andaman Islands.

No.	Name.	North-Western India.	Central India and Deccan.	Western Gháts and Coast.	Ceylon.	Bengal, North-Eastern Himalaya, and Assam.	Burma.	Malaya and Andamans.
1	2	3	4	5	6	7	8	9
1	Arundinaria Walkeriana, Munro	...	...	1	1	...	...	...
2	" Wightiana, Nees	...	...	1	1	...	...	...
3	" floribunda, Thw.	...	...	...	1	...	...	...
4	" elegans, Kurz	...	...	...	...	1	1	...
5	" polystachya, Kurz	...	...	...	...	1	...	...
6	" debilis, Thw.	...	...	...	1	...	...	...
7	" densifolia, Munro	...	...	1	1	...	...	...
8	" racemosa, Munro	...	...	...	...	1	...	...
9	" Griffithiana, Munro	...	...	...	...	1	...	...
10	" callosa, Munro	...	...	...	...	1	...	...
11	" falcata, Nees	1	...	...	...	...	...	...
12	" khasiana, Nees	...	...	...	...	1	...	...
13	" intermedia, Munro	...	...	...	...	1	...	...
14	" Hookeriana, Munro	...	...	...	...	1	...	...
15	" spathiflora, Trin.	1	...	...	...	...	...	...
16	" aristata, Gamble	...	...	...	...	1	...	...
17	" Falconeri, Hooker	1	...	...	...	1	...	...
18	" Prainii, Gamble	...	...	...	...	1	...	...
19	" microphylla, Munro	...	...	...	...	1	...	...
20	" hirsuta, Munro	...	...	...	...	1	...	...
21	" Gallatlyi, Gamble	...	...	...	...	...	1	...
22	" Jaunsarensis, Gamble	1	...	...	...	...	...	...
23	" Rolloana, Gamble	...	...	...	...	1	...	...
24	" suberecta, Munro	...	...	...	...	1	...	...
25	" Kurzii, Gamble	...	...	...	...	...	...	1
26	" Mannii, Gamble	...	...	...	...	1	...	...
27	Phyllostachys bambusoides, Sieb. and Zucc.	...	...	...	...	1	...	...
28	" Mannii, Gamble	...	...	...	...	1	...	...
29	Bambusa Tulda, Roxb.	...	1	...	...	1	1	...
30	" nutans, Wall.	1	...	...	...	1	...	...
31	" teres, Ham.	...	...	...	...	1	...	...
32	" Ridleyi, Gamble	...	...	...	...	...	...	1
33	" burmanica, Gamble	...	...	...	...	...	1	...
34	" polymorpha, Munro	...	...	...	...	1	1	...
35	" pallida, Munro	...	...	...	...	1	1	...
36	" affinis, Munro	...	...	...	...	...	1	...
37	" khasiana, Munro	...	...	...	...	1	...	...
38	" nana, Roxb.	...	...	...	...	1	1	1

No.	NAME.	North-Western India.	Central India and Deccan.	Western Ghâts and Coast.	Ceylon.	Bengal, North-Eastern Himalaya, and Assam.	Burma.	Malaya and Andamans.
1	2	3	4	5	6	7	8	9
39	Bambusa Balcooa, Roxb. ...	1	...	...	...	1	1	...
40	,, vulgaris, Schr. ...	...	...	1	1	1	1	1
41	,, Binghami, Gamble ...	...	...	...	...	...	...	1
42	,, Kingiana, Gamble ...	...	...	...	...	...	1	...
43	,, lineata, Munro ...	...	...	...	...	...	...	1
44	,, schizostachyoides, Munro ...	...	...	...	...	...	...	1
45	,, Griffithiana, Munro ...	...	...	...	...	...	1	...
46	,, Wrayi, Stapf ...	...	...	...	...	...	...	1
47	,, Blumeana, Sch. ...	...	...	...	...	...	...	1
48	,, arundinacea, Willd. ...	1	1	1	1	1	1	...
49	,, auriculata, Kurz ...	...	...	...	...	1	1	...
50	,, villosula, Kurz ...	...	...	...	...	...	1	...
51	,, Mastersii, Munro ...	...	...	...	...	1	...	...
52	,, marginata, Munro ...	...	...	...	...	...	...	1
53	Thyrsostachys Oliveri, Gamble ...	...	...	...	...	...	1	...
54	,, siamensis, Gamble ...	...	...	...	...	...	1	1
55	Gigantochloa verticillata, Munro ...	...	...	...	...	...	...	1
56	,, Scortechinii, Gamble ...	...	...	...	...	...	...	1
57	,, macrostachya, Kurz ...	...	...	...	...	1	1	...
58	,, Wrayi, Gamble ...	...	...	...	...	...	...	1
59	,, Kurzii, Gamble ...	...	...	...	...	...	...	1
60	,, heterostachya, Munro ...	...	...	...	...	...	...	1
61	,, ligulata, Gamble ...	...	...	...	...	...	...	1
62	,, latispiculata, Gamble ...	...	...	...	...	...	...	1
63	Oxytenanthera nigrociliata, Munro ...	...	1	...	...	1	1	1
64	,, albociliata, Munro ...	...	...	...	...	...	1	...
65	,, sinuata, Gamble ...	...	...	...	...	...	...	1
66	,, parvifolia, Brandis ...	...	...	...	...	...	1	...
67	,, Thwaitesii, Munro ...	...	...	1	1	...	...	...
68	,, monostigma, Beddome ...	...	...	1	...	...	...	...
69	,, Stocksii, Munro ...	...	...	1	...	...	...	...
70	,, Bourdilloni, Gamble ...	...	...	1	...	...	...	...
71	Dendrocalamus strictus, Nees ...	1	1	1	...	...	1	...
72	,, sericeus, Munro ...	...	1	...	...	...	...	...
73	,, membranaceus, Munro ...	...	...	...	...	...	1	...
74	,, sikkimensis, Gamble ...	...	...	...	...	1	...	...
75	,, Hookeri, Munro ...	1	...	...	...	1	...	...
76	,, Hamiltonii, Nees and Arn.	1	...	...	...	1	1	...
77	,, patellaris, Gamble ...	...	...	...	...	1	...	...
78	,, giganteus, Munro ...	...	...	...	...	1	1	1
79	,, calostachyus, Kurz ...	...	...	...	...	...	1	...
80	,, longispathus, Kurz ...	...	...	...	...	1	1	...
81	,, Brandisii, Kurz ...	...	...	...	...	...	1	...
82	,, flagellifer, Munro ...	...	...	...	...	...	...	1
83	,, longifimbriatus, Gamble	...	...	...	...	...	...	1
84	,, Parishii, Munro ...	1	...	...	...	...	...	...
85	,, Collettianus, Gamble ...	...	...	...	...	...	1	...
86	Melocalamus compactiflorus, Bth. & Hk. f.	...	...	...	...	...	1	...
87	Pseudostachyum polymorphum, Munro	...	...	...	...	1	1	...
88	Teinostachyum Griffithii, Munro ...	...	...	...	...	1	1	...
89	,, Wightii, Beddome ...	...	...	1	...	...	...	...
90	,, attenuatum, Munro ...	...	...	...	1	...	...	...
91	,, Dullooa, Gamble ...	...	...	...	...	1	1	...
92	,, Helferi, Gamble ...	...	...	...	...	1	1	...
93	Cephalostachyum capitatum, Munro ...	...	...	...	...	1	...	...
94	,, pallidum, Munro ...	...	...	...	...	1	1	...
95	,, latifolium, Munro ...	...	...	...	...	1	1	...
96	,, Fuchsianum, Gamble	...	...	...	...	1	...	...
97	,, pergracile, Munro ...	...	1	...	...	1	1	...
98	,, flavescens, Kurz ...	...	...	...	...	...	1	...
99	,, virgatum, Kurz ...	...	...	...	...	...	1	...
100	Dinochloa Tjangkorreh, Büse ...	...	...	...	...	...	...	1
101	,, McClellandii, Kurz ...	...	...	...	...	1	1	1
102	Schizostachyum tenue, Gamble. ...	...	...	...	...	...	...	1
103	,, chilianthum, Kurz ...	...	...	...	...	...	...	1
104	,, Blumei, Nees von Es. ...	...	...	...	...	...	...	1
105	,, latifolium, Gamble ...	...	...	...	...	...	...	1
106	,, aciculare, Gamble ...	...	...	...	...	...	...	1

No.	NAME.	North-Western India.	Central India and Deccan.	Western Ghâts and Coast.	Ceylon.	Bengal, North-Eastern Himalaya, and Assam.	Burma.	Malaya and Andamans.
1	2	3	4	5	6	7	8	9
107	Melocanna bambusoides, Trin. ...	...	...	...	...	1	1	...
108	„ humilis, Kurz ...	...	...	...	...	...	1	...
109	Ochlandra Rheedii, Bth. & Hk. f. ...	...	...	1	...	...	...	...
110	„ stridula Thw. ...	...	...	...	1	...	...	...
111	„ Beddomei, Gamble ...	...	...	1	...	...	...	...
112	„ travancorica, Bth. ...	...	...	1	...	...	...	...
113	„ Brandisii, Gamble ...	...	...	1	...	...	...	...
114	„ Ridleyi, Gamble ...	...	...	...	...	...	...	1
115	„ setigera, Gamble ...	...	...	1	...	...	...	...
	Total indigenous ...	7	6	15	9	46	39	29
	„ naturalized ...	4	...	1	1	3	3	2
	GRAND TOTAL ...	11	6	16	10	49	42	31

In region (1), NORTH-WEST INDIA, the chief bamboo is *Dendrocalamus strictus*, which is found in forest regions throughout the area, up to about 3,000 feet in the hills. In Bihar and Gorukhpur, *Bambusa Balcooa* is common about villages. In the Himalaya there are four species of *Arundinaria*, of which the most abundant are *A. falcata* and *A. spathiflora*. Commonly planted everywhere is the thorny *Bambusa arundinacea*, while *B. nutans*, *Dendrocalamus Hamiltonii*, and *D. Hookeri* are cultivated in the lower hills and the plains adjoining. In all there are 11 species, 7 wild and 4 acclimatized.

In region (2), CENTRAL INDIA AND THE DECCAN, two species are prominent: *Dendrocalamus strictus* on the drier hill slopes and in drier plains forests, and *Bambusa arundinacea* in the hill valleys, along the rivers and (in a stunted form) on waste lands near the eastern coast. *Bambusa Tulda* occurs in the hills of the Eastern Ghâts in Vizagapatam and Godavari districts; *Dendrocalamus sericeus* on the hill of Parasnâth in Chota Nagpur; *Cephalostachyum pergracile* in the Singhbhum forests; and *Oxytenanthera nigrociliata* in Orissa. There are six species in all.

Region (3), THE WESTERN GHATS AND COAST, is characterized by the prevalence of the genera *Oxytenanthera* and *Ochlandra*. Of the former genus, four species occur, the chief of which is *Oxytenanthera Thwaitesii*; while of the latter there are five species, the most striking of which is the gregarious reed-like *Ochlandra travancorica*, remarkable for its large flowers and huge fruits. On the higher hills are found three species of *Arundinaria*, the most common of which is *A. Wightiana*, so prevalent on the Nilgiri Hills. *Teinostachyum Wightii* is found in the dense forests of the Western Ghâts. *Bambusa arundinacea* and *B. vulgaris* are frequent along the Malabar Coast and in the valleys leading into it. The number of species is 16, of which one is acclimatized only.

In region (4), CEYLON, nine indigenous and one acclimatized species are found, only four of which are really endemic, viz., the two Arundinarias, *A. debilis* and

A. floribunda, *Teinostachyum attenuatum* and *Ochlandra stridula*. Thus, the bamboo flora of Ceylon may be said to approach very nearly to that of the hills of the Western Ghâts of Southern India.

In region (5), BENGAL, NORTH-EAST HIMALAYA AND ASSAM, the most characteristic species are probably *Dendrocalamus Hamiltonii* in the north, *Bambusa Tulda* in the middle region, and *Melocanna bambusoides* in the south; all of them gregarious species. This region has the large number of 49 species so far known, but of these 3 are acclimatized only. The most noticeable point is the abundance of species of *Arundinaria* and *Phyllostachys*, of which there are no less than 18 species described up to date. In order, however, to discuss the characteristics of this region, we must divide it into sub-regions and refer to each separately. In the *first* sub-region, the plains country of Lower Bengal and the valleys, *Bambusa Tulda*, *B. Balcooa*, and *B. arundinacea* are found about villages. In the *second*, the hills of the North-East Himalaya in Sikkim and Bhutan, the common species of the lower hills and "Terai" is *Dendrocalamus Hamiltonii*; as we ascend up to 4,000 feet, *Bambusa nutans*, *Dendrocalamus sikkimensis* and *Arundinaria intermedia* are met with, with other less common species; higher up again, 4,000 to 6,000 feet, come *Cephalostachyum capitatum*, *Pseudostachyum polymorphum*, *Arundinaria Hookeriana*, *Teinostachyum Dullooa*, *Dendrocalamus patellaris* and others; in the forests of 6,000 to 9,000 feet comes *Arundinaria racemosa*, the common gregarious small bamboo of Darjeeling; while above 8,000 feet we get the small variety of the same with *A. aristata* and *A. Falconeri*. In the *third* sub-region, of Assam and the Khasia and Naga Hills, the low country is characterized by Bambusas such as *B. Tulda*, *B. nutans*, *B. teres*, *B. pallida*, *B. khasiana*, and *B. Balcooa*; with *Gigantochloa macrostachya*, *Dendrocalamus Hookeri*, *D. Hamiltonii* and *D. longispathus*, *Pseudostachyum polymorphum*, *Teinostachyum Griffithii* and *T. Dullooa*, and *Melocanna bambusoides*; while the hills are remarkable for several species of *Arundinaria* such as *A. elegans*, *A. polystachya*, *A. Griffithiana*, *A. callosa*, *A. khasiana*, *A. hirsuta*, *A. suberecta*, and the interesting new species *A. Prainii*, *A. Mannii*, and *A. Rolloana*. To these may be added *Phyllostachys bambusoides*, *Teinostachyum Helferi*, and several species of *Cephalostachyum*, the chief of which are *C. capitatum* and *C. pergracile*. *Dendrocalamus sikkimensis* occurs in the Garo Hills, and in Sylhet *Bambusa polymorpha* and *Melocalamus compactiflorus* may be found. Finally, the *fourth* sub-region of Chittagong and its Hill Tracts is noticeable for the dense growth of *Melocanna bambusoides* covering the low hills with its culms which, being thrown up from suckers, speedily occupy every vacant space of ground. In the valleys and forests *Bambusa Tulda*, *Teinostachyum Dullooa*, *Gigantochloa macrostachya*, *Dendrocalamus longispathus*, *Melocalamus compactiflorus* and *Dinochloa McClellandi* are the most remarkable kinds.

Region (6), BURMA, has so far produced 42 species,* of which 3 acclimatized; but this is only a beginning, for new species are being discovered as Upper Burma is explored, and it may be noted that, during the printing of this work, the beautiful

* 44, with the two described in appendix.

Chinese *Dendrocalamus latiflorus* has been sent from the Shan Hills, and Mr. J. W. Oliver has added one more to his many discoveries in a very pretty new kind with striped anthers, which has been described as *Bambusa Oliveriana*. The most common bamboos of Burma are *Myinwa (Dendrocalamus strictus)*, *Tinwa (Cephalostachyum pergracile)*, *Kyathoungwa (Bambusa polymorpha)* and *Wapyugale (Oxytenanthera albociliata)*, "all these growing on rocky strata or on shallower "alluvium, while *Kyakatwa (Bambusa arundinacea)* is restricted to the plains in "deep alluvium near larger rivers" (Kurz—Preliminary Report on the forest and other vegetation of Pegu.—Calcutta, 1875, p. 50). The largest species is the acclimatized *Dendrocalamus giganteus*, of which magnificent plantations exist in various places, and notably near Myanoung on the Irawadi; but not far off come *Dendrocalamus Brandisii*, *D. Hamiltonii*, *Gigantochloa macrostachya*, *Bambusa Tulda*, *B. burmanica* and *B. polymorpha*. Of *Arundinaria*, two species are found, both scarce. Of the new genus *Thyrsostachys*, there are two species, both of which are beautiful kinds and valuable; of *Oxytenanthera* there are three species, and other genera are also represented.

Region (7), MALAYA, with Lower Tenasserim and the Andamans, has so far been only incompletely explored. South Tenasserim is but little known, and only recently two beautiful species, *Bambusa Binghami* and *Dendrocalamus longifimbriatus*, have been received from the Maliwôn forests near the Pakchan river, which may be the precursors of still more interesting kinds to follow. In the Andamans and Nicobars and adjacent islands only five species are so far known to exist; the most common is *Dinochloa Tjangkorreh*, a powerful climber, next come *Oxytenanthera nigrociliata* and *Bambusa schizostachyoides*, these being the only three which occur in the main islands. Dr. Prain has, however, discovered *Bambusa lineata* on Rutland Island, and *Dendrocalamus strictus* in Great Cocos. The Straits Settlements and the territories of the native princes in alliance with our Government contain many bamboos, and in this Malay region the most noticeable thing is the prevalence of species of the genera *Gigantochloa* and *Schizostachyum*. The most common species is probably *Dendrocalamus flagellifer*, which grows to a very large size, as does *D. giganteus*, which is here in its own home. *Bambusa Wrayi* forms forests on the hills of Perak, and the introduced *Bambusa nana* forms thickets on the hills. Thanks to Mr. Ridley of the Singapore Gardens, much information has already been obtained regarding the Malay bamboos; but there is no doubt but that much has yet to be learned, and that most of the common species of Java and Sumatra will yet be found to belong also to the Indo-Malayan flora. In this work are described from the Malay region 31 species, of which 29 indigenous and two naturalized.

The USES to which bamboos are put have been so often described that there is little, if anything, more to be added regarding them. So far as possible, an account of the uses to which the different species have been put has been given under each; and further reference is invited to the writings mentioned already in referring to "Tabashir," all of which contain much information. Besides them, too, Sir D. Brandis' "Forest Flora of North-West and Central India,"

Colonel Beddome's "Flora Sylvatica of the Madras Presidency and Ceylon," Mr. S. Kurz's "Preliminary Forest Report of Pegu," the "Manual of Indian Timbers," the "Special Catalogue of the exhibits of the Government of India and private exhibitors at the Colonial and Indian Exhibition, 1886," and other similar catalogues, the introductions to the monographs of Ruprecht and Munro, and various papers in the "Indian Forester," the Proceedings of the Agri-Horticultural Societies, and other Indian publications, afford information of value and importance. For those who have lived for some time in India, it is difficult to imagine how the country would get on without bamboos, for from bamboo—at any rate in all but the very driest regions to which it would be too far to carry them profitably—are made the houses, the furniture, the carts, the fittings of boats, the fences, the domestic utensils, the weapons: in short, almost all the objects of daily use, and the necessaries of daily life. Bamboos are also used as food, both by the people (grain and young shoots) and by their cattle (the leaves); as a material for making paper; as a means to procure fire; and in plantation, as ornaments to the villages and gardens.

The propagation of bamboos is simple enough: it is best done by *seed*, but can be done by taking *root-offsets*, though in this case there is always a danger of the resulting clumps flowering when the parent clump flowers (we have seen this clearly in recent plantations at the base of the Saharanpur Siwaliks, North-Western Provinces), also by *layers* from branches bent to the ground and pegged down, and lastly by *cuttings*, though these latter are by no means easy to get to strike.

The management of bamboo forest is easy if the clumps have been attended to from the beginning, *that is*, if dry culms have been regularly removed, if cutting at or near ground level has alone been permitted, and if mature culms have been regularly thinned out yearly, so as to leave ample space for the development of new ones: but this state of things rarely exists in the natural forests, and especially in those in which cutting is given over to contractors or allowed on permit. Consequently, to bring such forests into a state fit to give the best yield in material and revenue, the interference of the owner is necessary, and often some considerable capital expenditure. On this subject "The exploitation of bamboo forest, *Ind. Forester* XVII, 186," may be consulted; the article refers to Northern India and chiefly to the common *Dendrocalamus strictus*, but the recommendations will also apply to most other useful kinds.

In Burma, the majority of teak forests are composed of a main crop of bamboos, above the canopy of which appear the crowns of trees and especially teak, and it is only when a year of bamboo-seeding takes place that suppressed young teak can get a start or teak seedlings appear. So that it is necessary for forest officers to watch and see when indications of flowering are given, and be ready, after clearing off the dry crop of bamboos by fire, to restock as much as possible of the area, either by allowing natural teak seedlings to come on, or by sowing or planting artificially. The species which are in this way chiefly associated with teak are the "Myinwa" (*Dendrocalamus strictus*), "Tinwa" (*Cephalostachyum pergracile*), and "Kyathaungwa" (*Bambusa polymorpha*).

Soon after I commenced my career in India as a forest officer, my attention was very forcibly drawn to the difficulties which existed in recognizing in the forests, and especially in the great evergreen forests, the trees which were met with, and among them the various species of bamboo. The leaves of bamboos, and especially those of the bigger species, have such a very similar appearance, that either in the field or from dried leaf specimens, it is most difficult to say to which species any given example belongs. On individual clumps, too, the leaves may vary so greatly in size and shape, according to the part they are taken from, that one cannot always be sure of identification. In this way, I was led to examine closely, in the part of the country in which I was at work from 1872 onwards, such clumps as I met with, in order to see if I could not discover some better characters for certain identification which could be used by the forest staff. In 1872 I had made the acquaintance of the late Mr. Sulpiz Kurz, Curator of the Herbarium of the Royal Botanic Garden, Calcutta, and found that he, too, was greatly interested in the same subject and was actually engaged in preparing an account of the Indian and Malay species, paying special attention to those characters which were likely to help the forest officers of Burma, in whose behalf he was engaged on his well-known and excellent "Forest Flora," to enable them to distinguish between the many important kinds they came across daily. Mr. Kurz's work on the bamboos began with the publication in January 1876, in vol. I of the then newly-established magazine, the "Indian Forester," of a paper on "Bamboo and its use," which admirable article is still probably the best general treatise on the subject: and was followed, in April of the same year, by an account of the species known to him to be found in the Indian Archipelago and Malaya, and which he had carefully studied in the Botanic Garden at Buitenzorg in Java. Mr. Kurz's intention had been to give next an account of the Indian species, but his sad death at Penang in December 1877 prevented this, though the materials he had collected, consisting of Herbarium specimens, drawings, notes and dissections, were left available, and have been fully utilized in the present work. So far as the Burmese species were concerned, his "Forest Flora of British Burma" had supplied all that was known at that time, but the species of India proper still remained.

In 1887, I was in England on furlough, and while there I took the opportunity of carrying my own collections to Kew in order to compare them with the valuable set in the Royal Herbarium, with the intention of putting together in a short paper some notes on the best means of recognizing species. Some friends, and especially Dr. George King of the Calcutta Garden, had recommended me to do more, and their advice was so strongly repeated by Sir Joseph Hooker, K.C.S.I., the late, and Mr. W. H. Thiselton-Dyer, C.M.G., C.I.E., the present, Director of the Royal Gardens at Kew, that I was induced to try my best to carry out their wishes. The result is the present work, which Dr. George King has so kindly assisted me to publish in the Annals of his great establishment. The list of those who have assisted me in the work is a long one, and I cannot too gratefully acknowledge the kind way in which my friends have helped me. Besides

having the valuable assistance of the Herbarium at Kew, the sets of bamboos from several other similar institutions were freely placed at my disposal. Dr. G. King, the Director, and Dr. D. Prain, the Curator of the Herbarium of the Royal Botanic Garden in Calcutta, not only allowed me the loan of the whole collection of that institution, but gave me constantly their advice and help in every way. The Saharanpur collections were placed at my disposal by Mr. J. F. Duthie, B.A., the Director of the Botanical Department in Northern India. Those of the Madras Central Museum were lent to me by Mr. E. Thurston, the Superintendent; and those of the Ootacamund Garden by Mr. M. A. Lawson, Director of the Botanical Department in Southern India. Dr. H. Trimen, F.R.S., most kindly lent me the collections and drawings belonging to the Royal Gardens at Peradeniya in Ceylon, and assisted me further with much information. The collection belonging to the Garden at Singapore was placed at my disposal by the Director, Mr. H. N. Ridley, F.L.S., who also gave me sets of his more recent discoveries in Perak, Penang and Johore.

It has sometimes been said that Indian forest officers did not do enough for the elucidation of the botany of the countries in which they are employed. So far as bamboos are concerned, the reproach must be cancelled most emphatically, for I have received from my brother officers in the Indian Forest Department the most signal assistance, and it is scarcely too much to say that without their kind help this work must have been a failure. From Assam, I received sets of nearly all the bamboos of the various districts, by the kindness of the Conservator, Mr. Gustav Mann, who himself collected or procured them, compared them himself, labelled and noted on them, giving the fullest particulars not only of their characteristics, but of their names and uses. For the Burmese bamboos I am chiefly indebted to Mr. J. W. Oliver, Conservator of the Eastern Circle of Upper Burma, whose magnificent collections have produced several new and valuable species. To Mr. P. J. Carter, Conservator in Pegu, Lieutenant-Colonel Bingham, Conservator in Tenasserim, and to Messrs. McHarg, Lowis, C. S. Rogers, Lane-Ryan, and others, I am also greatly indebted. For a set of bamboos collected in Sikkim I have to thank the late Mr. E. Fuchs, and for those of Orissa I have to acknowledge the aid of Babu Sree Dhur Chakravarti. For information regarding the bamboos of Bombay, I have chiefly to thank Mr. W. A. Talbot and Mr. R. C. Wroughton, Deputy Conservators; while at the instance of the Hon'ble A. T. Shuttleworth, Conservator of the Central Circle, sets from various districts were sent me by Messrs. Fagan, Wilkins, Osmaston, and Millett. Mr. T. F. Bourdillon, Conservator of Forests in the Travancore State, has sent me much important material to supplement the valuable collections made by Sir D. Brandis in Tinnevelly.

Besides Forest Officers, I have to thank Mr. G. A. Gammie of the Government Cinchona Plantations in British Sikkim, for sets of bamboos collected by him on his tours in the Darjeeling hills; and Mr. C. B. Clarke, F.R.S., now President of the Linnean Society, for valuable sets of his collections in Sikkim, the Khasia Hills, and Manipur. In the correction of the proofs I have to acknowledge the

assistance of Dr. G. King and Mr. J. F. Duthie. Finally, I wish to express my thanks to Sir Dietrich Brandis, K.C.I.E., late Inspector-General of Forests in India, for many valuable specimens and for notes and advice.

Wherever possible, I have given the *vernacular names* recorded by previous writers or attached to the specimens received, while an index of these names will be of help to some of those who may consult the work, in tracing the species they desire to find. At the same time it must be remembered that vernacular names are often very unreliable, and that the same name may be given to two or more different species in different parts of the country.

In regard to the *plates* attached to this work, it is well to record that the main drawings have all been done by native artists under my supervision, and chief among these artists was Mahomed Idrees, a student of the Madras School of Art, who worked under my supervision in Madras during 1888 to 1890. The rest have been done by draughtsmen attached to the Royal Botanic Garden, Calcutta, and one or two by Mr. Hormusji, draughtsman of the Botanical Department, Saharanpur. Some of the plates, as noted in the description, are borrowed; but most of them are from actual specimens, and I have endeavoured to give, for each species, as far as possible—(1) the leaves and leaf-sheath, (2) the culm-sheaths, (3) the flowers and inflorescence, (4) dissections of the various parts. These dissections are entirely my own work, and I hope, therefore, that I may be excused for their roughness in many instances. I regret that I found it impossible to draw the parts of these dissections fully to scale and to indicate their relative size. It would have taken far more time than I had available for the work.

H. P.—Reg. No. 2868J—350—8-8-95.

THE

BAMBUSEÆ

OF

BRITISH INDIA,

BY

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BAMBUSEÆ.

ARBORESCENT or shrubby grasses, sometimes climbing. *Culms* jointed; *nodes* more or less prominent and bearing *culm-sheaths* of various shapes; *internodes* hollow. *Leaves* flat, usually linear or oblong-lanceolate; petiole short, articulated with a *leaf-sheath* which is variously auricled. *Inflorescence* various, usually a large compound panicle with spicate branches. *Spikelets* 1- to many-flowered. *Empty glumes* 1 to several, gradually enlarged upwards; the lower sometimes bearing imperfect flowers. *Flowering glume* usually similar to empty glumes. *Palea* usually large and 2-keeled, sometimes not keeled and convolute, occasionally wanting. *Lodicules* usually 3, sometimes more, sometimes none. *Stamens* 3 or 6 or (in one genus) very many. *Ovary* globular or elongate, surmounted by the *style* which is sometimes undivided, but more usually cleft into 2 or 3 or rarely more *stigmas*. *Fruit* a caryopsis, with a thin crustaceous or fleshy pericarp adnate to or separable from the *seed*.

Sub-tribe 1. Arundinarieæ.—Stamens usually 3, palea 2-keeled. Pericarp thin, adnate to the seed. Mostly small shrubby species, (pp. 1 to 28).

Sub-tribe 2. Eubambuseæ.—Stamens 6. Palea usually 2-keeled. Pericarp thin, adnate to the seed. Mostly large species, (pp. 28 to 77).

Sub-tribe 3. Dendrocalameæ.—Stamens 6. Palea 2-keeled. Pericarp fleshy or crustaceous, separable from the seed, (pp. 77 to 111).

Sub-tribe 4. Melocanneæ.—Stamens 6 or more. Spikelets 1-flowered. Palea none or similar to the flowering glume. Pericarp crustaceous or fleshy, separable from the seed, (pp. 111 to 128).

Sub-tribe 1.—ARUNDINARIEÆ.

Spikelets 1- to many-flowered, racemose or paniculate, empty glumes 1 to 2 . 1. *Arundinaria.*
Spikelets 1- to 4-flowered, spicate, spikes bracteate, empty glumes 2-3 . . . 2. *Phyllostachys.*

1. **Arundinaria,** *Michaux.*

Erect or climbing shrubs. *Culms* slender, rarely over 1 in. in diameter; nodes usually prominent, internodes rather short; branches fasciculate from the nodes, short. *Culm-sheaths* thin, papery, straw-coloured; *imperfect blade* narrow, subulate. *Leaves* usually small, articulate on the sheath, many species bearing distinct regular transverse veinlets. *Inflorescence* variable, sometimes on separate culms, sometimes terminal on leafy culms, sometimes with leaf and flower branches intermixed, paniculate or racemose. *Spikelets*

1- to many-flowered, often long, compressed, the flowers usually all hermaphrodite except sometimes the terminal one, often enclosed in bracteate sheaths; *empty glumes* 2, membranous, unequal; *flowering glume* longer, concave, many-nerved, obtuse, acute or mucronate; *palea* usually shorter than the flowering glume, prominently 2-keeled, usually compressed. *Lodicules* 3, ovate or lanceolate, ciliate. *Stamens* 3, exceptionally up to 6, usually exserted, *anthers* generally blunt. *Ovary* globular above, often hairy; *style* short, early dividing into 2 or 3 plumose *stigmas*. *Caryopsis* oval or narrowly oblong, smooth, furrowed on the back, when ripe included in the persistent glume and palea.

Distrib.—About 47 to 50 known species, mostly Asiatic, from India, China, and Japan, but with about 5 North American (the chief being *A. macrosperma*, Michaux, of the Southern United States, and *A. acuminata*, Munro, from Mexico); 10 South American, and one from South Africa (*A. tessellata*, Munro). In Japan there are some five species, chief among which is the *A. japonica*, Sieb. and Zucc., which is cultivated in European gardens and in the Himalaya; and in China there are at least two (*A. sinica*, Hance, and *A. Hindsii*, Munro).

Analysis of the species.

Stamens 3, erect shrubs.
  Bracts of the inflorescence small.
    Inflorescence on leafy branches—SECTION I.
      Culm-nodes not bearing spines.
        Spikelets many, in large terminal panicles.
          Leaves large, thick, margins cartilaginous . . . . . . 1. *A. Walkeriana.*

          Leaves small, thin, margins membranous.
            Spikelets 3- to 5-flowered, flowers blunt . . . . . 2. *A. Wightiana.*
            Spikelets 5- to 8-flowered, flowers acuminate . . . 3. *A. floribunda.*

        Spikelets few, in short panicles.
          Spikelets long, flowers distant.
            Leaves narrow, with transverse veinlets . . . . . 4. *A. elegans.*
            Leaves rather broad, without transverse veinlets . . 5. *A. polystachya.*
          Spikelets short, flowers imbricating . . . . 6. *A. debilis.*

        Spikelets racemose.
          Spikelets 1-flowered, leaves very small . . . . 7. *A. densifolia.*
          Spikelets many-flowered, leaves moderately large . . . 8. *A. racemosa.*

      Culm-nodes with spines.
        Inflorescence terminal, glumes long, mucronate . . . . . . 9. *A. Griffithiana.*
        Inflorescence axillary, glumes blunt . . . . 10. *A. callosa.*

    Inflorescence on separate leafless culms—SECTION II.
      Leaves with no transverse veinlets, flowers usually 2, fertile.
        Rachilla of upper flower glabrous or nearly so . . . . . . 11. *A. falcata.*
        Rachilla of upper flower white, hairy above . . . . 12. *A. khasiana.*

      Leaves with transverse veinlets apparent when dry.
        Culms small, leaves small, leaf-sheaths ciliate, flowers usually 3 to 5 fertile . . . . 13. *A. intermedia.*
        Culms thicker, leaves rather large, leaf-sheaths not ciliate, flowers usually 1 fertile . . . . 14. *A. Hookeriana.*

Bracts of the inflorescence sheathing—Section III.
Transverse veinlets conspicuous, bracts large.
Bracts narrow, enclosing 2 to 3 spikelets . . . . 15. *A. spathiflora.*
Bracts broad, enclosing 3 to 5 spikelets . . . . 16. *A. aristata.*
Transverse veinlets inconspicuous, bracts short . . . . 17. *A. Falconeri.*
Stamens 6 or less, climbing shrubs—Section IV . . . . 18. *A. Prainii.*

Species of which the flowers are not known.

Culm-sheaths short, imperfect blade generally recurved.
Leaves with conspicuous transverse veinlets.
Culms from short rhizomes, cæspitose.
Leaves very small, under 1 in. long . . . . 19. *A. microphylla.*

Leaves moderate sized, up to 5 in. long.
Leaf-sheaths with many ciliæ, hirsute . . . . 20. *A. hirsuta.*
Leaf-sheaths with few ciliæ, glabrous . . . . 21. *A. Gallatlyi.*

Culms from elongated rhizomes, distant.
Leaves moderate sized. W. Himalaya . . . . 22. *A. jaunsarensis.*
Leaves large. E. Himalaya . . . . 23. *A. Rolloana.*

Leaves without transverse veinlets.
Leaves very narrow, branchlets short . . . . 24. *A. suberecta.*
Leaves narrow, papery, branchlets long, slender . . . . 25. *A. Kurzii.*

Culm-sheaths very long, imperfect blade erect, very long . . . . 26. *A. Mannii.*

Note.—Nos. 19, 20, and 21 probably belong to section I; Nos. 24 and 25 to section II; Nos. 22 and 23 to section III, and No. 26 to section IV.

SECTION I.

1. Arundinaria Walkeriana, *Munro in Trans. Linn. Soc.* xxvi. 21.

A shrubby bamboo with cæspitose stems. *Culms* small, 1 in. in diameter, upper part thickly covered with the sheaths of fallen leaves; internodes about 15 in. long, rather rough, striate. *Culm-sheaths* thin, papery. *Leaves* usually elliptic- or ovate-oblong, sometimes oblong-lanceolate, shortly pungent acuminate, rounded at the base and cucullate just above the short ·1 to ·2 in. thick petiole, pale beneath, glabrous; margins cartilaginous, thickened and recurved, spinulose-serrate; 5 to 11 in. long, 1 to 1·5 in. broad; main vein narrow, shining, secondary veins 6 to 10 pairs, intermediate about 5 to 6; very numerous, prominent, regular, transverse veinlets, which are raised beneath; *leaf-sheaths* striate, glabrous, cut off straight at the mouth, which is furnished with minute ciliæ below the petiole, and with a row of long pale bent bristles at the edge; *ligule* short. *Inflorescence* a large purple-red terminal compound panicle, rising from imbricated leafy branches, 6 to 12 in. long; branchlets filiform, striate, wavy, glabrous; lower axils glandular, upper with a few long hairs, at first closely pressed together, afterwards spreading. *Spikelets* purple, ·6 to ·7 in. long when young, up to 1 in. when older, narrow, glabrous, 3- to 4-flowered, uppermost flowers usually empty; *rachilla* wiry, flattened, ciliate on the inner side and furnished with a ring of hairs at the swollen tip; *empty glumes* 2, ·1 to ·2 in. long, nearly equal, the lower usually 3- and the upper 5- or more

nerved, angled, ciliate on the margins and apiculate; *flowering glumes* similar, but larger, with 2 prominent nerves and intermediate finer ones; *palea* 2-keeled, ciliate on the keels, acute or bifid at the tip, about as long as flowering glume. *Lodicules* 3, obtuse, fimbriate, 1 smaller, 3-nerved, nerves wavy. *Stamens* with short filaments and obtuse *anthers*. *Ovary* glabrous, *style* swollen at the base and soon divided into two feathery *stigmas*. *Caryopsis* not known. *Beddome Flora Sylv.* ccxxx.

Ceylon, higher hills of the north-east system of mountains in the Central Province, where it was collected by Mrs. Walker and by Messrs. Watson, Thwaites, and Trimen. Also in the Pulney Hills in South India (Beddome, 1873).

This handsome species is recognised by its purple panicles and large thick leaves with cartilaginous edges. Beddome's Pulney Hill specimens (leaves only) have the leaves longer and narrower than those from Ceylon, but I consider them to belong to this species. Thwaites' No. 3860 referred to this by Munro is, I consider, true *A. Wightiana*. This species probably flowers frequently, but is known to have done so only in 1861 and 1888.

PLATE No. 1.—*Arundinaria Walkeriana*, Munro. 1, leaf-branch; 2, part of flower panicle—*of natural size*; 3, spikelet; 4 & 5, empty glumes; 6, flowering glume; 7, palea; 8, lodicule; 9, stamen; 10, ovary and stigmas; 11, venation of leaf—*enlarged*. (All from Mrs. Walker's specimens).

2. ARUNDINARIA WIGHTIANA, *Nees in Linnæa* ix. 482 (1834).

An erect, gregarious shrub with slender culms arising from short branching rhizomes. *Culms* 6 to 10 feet high, occasionally higher, dark green, turning yellowish-brown with age; nodes swollen and with a hairy ring below them formed by the bases of fallen sheaths; internodes 10 to 14 in. long, usually flattened on one side, prominently striate when young, usually rough; branchlets many, verticillate from the nodes, either of leaves only or of leaves and flowers mixed. *Culm-sheaths* papery, straw-coloured, prominently striate, 4 to 8 in. long by 1 to 3 in. broad, slightly narrowed upwards, covered thickly at the base and less so above with stiff golden hairs arising from tubercular bases; *imperfect blade* wavy, narrow, subulate, 1 to 1·5 in. long by ·1 to ·2 in. broad, scabrid; *ligule* short, truncate, fimbriate on the edge. *Leaves* of leaf-bearing branches 5 to 7 in. long by ·75 to 1 in. broad, rounded or slightly narrowed at the base into a very short, somewhat swollen petiole, tip long acuminate, margins incurved; the edges scabrid; glabrous above, glaucescent beneath and usually glandular-pubescent on the midrib; main veins hardly prominent above, shining below, secondary veins 5—7 pairs, intermediate usually 5, transverse veinlets numerous, regular, prominent, raised beneath: those of flowering branches smaller, more rounded at the base; *leaf-sheaths* striate, keeled, often purple, sometimes covered with numerous strong bulbous-based strigose hairs, ciliate at the edges and furnished at the mouth with 5 to 8 long stiff bristles; *ligule* short, blunt, often dentate. *Inflorescence* in dense, leafy, terminal, spreading panicles, with capillary, flexuose branchlets, axils glandular. *Spikelets* on long slender pedicels, 3- to 5-flowered, purple, the uppermost flower usually sterile, glabrous or slightly scabrid-hirsute; *rachilla* flattened, finely ciliate, thickened at top; *empty glumes* two, ovate acute, the lower 5- the upper 7-nerved; *flowering glume* ovate, 9- to 11-nerved, with transverse nerves, mucronate, often scabrous-hispid outside; *palea* 2-cuspidate, 2-keeled, ciliate on the keels, 2-nerved on the sides and 1-nerved, with transverse nerves, between

the keels. *Lodicules* 3, usually two obtuse larger, one acute smaller, ciliate, 3- to 7-nerved. *Stamens* with short filaments, *anthers* brown, acute. *Ovary* glabrous, *style* entire at the base, soon dividing into two plumose *stigmas*. *Caryopsis* elliptic, acute, ·1 to ·2 in. long, deeply furrowed on one side. *Ruprecht Bamb.* 26, tab. III, fig. 10; *Munro in Trans. Linn. Soc.* xxvi. 19. *Beddome Flora Sylv.* ccxxx, *Anal. Gen.* t. 28; *Brandis For. Flora* 563; *Steudel Syn.* 335; *Thwaites Enum. Plant. Zeyl.* 444.

VAR. β. HISPIDA, leaf-sheaths and stems thickly covered with golden hairs, from a bulbous base; internodes more prominently flattened on one side. *A. hispida*, Steudel Syn. 335; *A. moliniformis*, Hochst. in Herb. Hohenacker No. 1282.

Hills of South India and Ceylon, most common on the Nilgiris, where it covers the upper slopes of the hills above 6,000 feet chiefly as an underwood in 'sholas' of *Eugenia*, *Michelia*, *Ilex* and other trees. It is especially common on the sides of Doddabetta (8,600 feet) and in the Kundahs Range, where also var. β is found, chiefly on the crest of the ghats from Sispara to Makurti. It has been collected by Wight, Hohenacker, and many others in Nilgiris; by Beddome in Palghat and Tinnevelly; and by Thwaites on Pedrotallagalla in Ceylon at 8,000 feet (C. P. 3860).

This very pretty species flowers annually, and being practically the only Nilgiri reed-like bamboo, is at once recognized in those hills. It is commonly used for mat-making and baskets, also for fences.

PLATE No. 2.—*Arundinaria Wightiana*, Nees. 1, leaf-branch; 2, part of flower panicle; 3, node of culm—*of natural size;* 4, culm-sheath—*reduced* $\frac{1}{3}$; 5, spikelet; 6 & 7, empty glumes; 8, flowering glume; 9, palea; 10, flower with glume and palea removed to show lodicules, ovary and stamens; 11, lodicules; 12, stamen; 13, caryopsis; 14, venation of leaf—*enlarged* (from fresh specimens gathered by myself).

3. ARUNDINARIA FLORIBUNDA, *Thwaites Enum. Plant. Zeyl.* 375.

A small erect shrubby bamboo. *Culms* 2 to 5 ft. high; internodes 2 to 4 in. long, very hairy at top with retrorse hairs. *Leaves* lanceolate, acuminate, glabrous, spinulose-serrate on the edges, more or less attenuate into a very short petiole at the base, the petiole with two glands; main vein narrow, secondary veins 3 to 4 pairs with about 5-6 intermediate and many regular and conspicuous transverse veinlets; *leaf-sheaths* striate, sometimes hispid with long hairs from tubercular bases, ending in a minutely ciliate membrane below the petiole and in short auricles furnished with 5 to 8 long twisted bristles; *ligule* short, often fimbriate. *Inflorescence* a large terminal panicle, the branches at first appressed, afterwards spreading, filiform, axils glandular. *Spikelets* usually 1 in. long, minutely silkily pubescent, 5- to 8-flowered, the uppermost empty; *rachis* angular, dilated above, curved between the flowers and conspicuous; *empty glumes* 2, outer ·1 to ·2 in. long, acute, 3-nerved, ciliate at apex, inner similar but longer and more nerved; *flowering glume* ·3 in. long, acuminate, 7—9-nerved, ciliate at the apex; *palea* as long, glabrous, 2-keeled, ciliate on the keels, bicuspidate. *Lodicules* 3, two broad, ovate, fimbriate; the third small, narrow, fimbriate. *Stamens* with short filaments, *anthers* blunt. *Ovary* glabrous; *style* short, at once separating into 2 flat

lacerate *stigmas*. *Caryopsis* ·2 in. long, red, linear, crowned with the base of the bifid style. *Munro in Trans. Linn. Soc.* xxvi. 20; *Beddome Flora Sylv.* ccxxx.

Mountains of Ceylon. Collected by Thwaites in the Maturatte District at 5,000 feet in 1853 (C. P. 2624).

This species is very near to *A. Wightiana*, but differs, according to Munro, in the generally appressed branches of the panicle and the much longer, almost silkily pubescent, spikelets containing sometimes 6 to 8 flowers.

PLATE No. 3.—*Arundinaria floribunda*, Thw. 1, leaf-branch with young flowering panicle; 2, flowering branch—*of natural size;* 3, spikelet; 4 & 5, empty glumes; 6, flowering glume; 7, palea; 8, lodicules; 9, stamen; 10, ovary and stigmas; 11, venation of leaf—*enlarged* (all from Thwaites' specimens).

4. ARUNDINARIA ELEGANS, *Kurz in Journ. As. Soc. Beng.* xlii. 248 (1873).

An evergreen, slender, tufted, shrubby bamboo. *Culms* green or blackish, 12 to 20 ft. high, ·3 to ·8 in. in diameter, flattened on one side in alternate joints; nodes somewhat raised; internodes 7 to 9 in. long, smooth. *Culm-sheaths* one-third the length of the internodes, papery, striate, minutely hispid above, narrowed in the upper third to a truncate mouth bearing minute auricles; *imperfect blade* narrow, subulate, recurved; *ligule* rather broad, finely ciliate. *Leaves* linear-lanceolate, long-acuminate, 4 to 5 in. long by ·3 to ·5 in. broad, narrowed at the base into a ·1 to ·2 in. petiole; smooth above, glaucescent beneath; cartilaginous and scabrous on the margins; main vein conspicuous, yellow, shining beneath, secondary veins 4 to 6 pairs, intermediate 8, transverse veinlets very many, raised beneath, finely tessellate; *leaf-sheaths* striate, smooth, ending in a minutely ciliate callus, and furnished with short auricles bearing a few long bristles; *ligule* very short. *Inflorescence* a terminal interrupted leafy panicle or raceme bearing pedicellate spikelets; rachis thin, wiry, curving, pubescent. *Spikelets* 1 in. or more long, flattened, 7- to 8-flowered; rachilla visible, wiry, clavate; *empty glumes* 2, ·2 in. long, 3- to 5-nerved, ovate-acuminate, keeled, ciliate on keel; *flowering glume* similar, 7-nerved with transverse veins; *palea* shorter, 2-keeled, white ciliate on the keels, obovate, bifid at the apex, 2-nerved between keels, 1-nerved on either side. *Lodicules* 3, 3- to 5-nerved, ovate, acute, long ciliate. *Stamens* hardly exserted, *anthers* purple, rounded or mucronate at the tip. *Ovary* smooth, oblong, surmounted by the *style*, which is at once divided into two white plumose *stigmas* with thickened bases. *Caryopsis* not known. *Kurz For. Fl. Burma* ii. 549.

Hills of Eastern Burma, extending from Tenasserim and the stunted forests of the Nattaung Hills in Martaban at 5,000 to 7,500 feet elevation, northwards into the Naga Hills of Assam.

This is the chief Burmese species and was collected by Kurz in 1872, in the Nattaung Hills, in flower. He also identified with it the specimens collected by Dr. J. Anderson at Poneshee on the Yunan Expedition in 1868, and these agree with the collections of G. Gallatly made for the Calcutta Botanic Garden in Tenasserim in 1877 (No. 746, Taipo, 5,000 feet); but both these have the leaflets in pairs, supported by loose sheaths and the culms markedly flat on one side, which would seem to bring them nearer to *Phyllostachys*. I also identify as this species the *Jilli* (Naga) collected by

James Rollo and Sri Gopal Banerjee in 1889 on the Naga Hills at 5,500 feet, where it is used for the walls of native huts.

PLATE No. 4.—*Arundinaria elegans*, Kurz. 1, leaf-branch; 2 & 3, flowering branchlets; 4, part of young culm—*of natural size;* 5, culm-sheath—*slightly reduced;* 6, spikelet; 7 & 8, empty glumes; 9, flowering glume; 10, palea; 11, lodicule; 12, anther; 13, ovary and stigmas; 14, transverse venation of leaf—*enlarged* (from Kurz' No. 144 from the Nattaung Hills).

5. ARUNDINARIA POLYSTACHYA, *Kurz MS.*

A small shrubby bamboo. *Culms* rather soft. *Culm-sheaths* not known. *Leaves* soft, green, 6 to 8 in. long, ·7 to 1 in. broad, lanceolate, acuminate; rounded or attenuate at the base into a very short petiole; ending above in a twisted point; rough above, thinly white hairy or smooth beneath; scabrous on one edge; main vein rather broad, secondary veins 5 pairs, conspicuous, intermediate 5 to 7, transverse veinlets none or very few, but lines of pellucid glands between the intermediate veins; *leaf-sheaths* greenish-yellow, striate, glabrous, ending in a broad bifid callus, and produced upwards to met the ligule; *ligule* long, striate, blunt, fimbriate. *Inflorescence* a terminal or axillary racemose leafy panicle, bearing narrow papery bracts about 1 in. long; rachis channelled on one side. *Spikelets* pedicellate, ·5 to ·7 in. long, 4- to 6-flowered, the uppermost imperfect; *rachilla* clavate, white-bearded, conspicuous; *empty glumes* 2, ovate acuminate, ·2 to ·3 in. long, 5- to 7-nerved, keeled and ciliate towards the tip; *flowering glumes* ovate, long acuminate, ·4 to ·5 in. long, 7—9-nerved, ciliate on the edges; *palea* longer than flowering glume, 2-keeled, ciliate on the keels, mucronate, bifid at apex, 1-nerved between and 1-nerved on either side of the keels. *Lodicules* 3, usually 2 ovate, obtuse, fimbriate, with 3 conspicuous areolate veins, and others smaller; the third ovate, acute, 3-veined. *Stamens* exserted; *anthers* long, apiculate, filaments often flexuose. *Ovary* ovoid, glabrous; *style* short and at once divided into two long plumose *stigmas* with thickened bases.

North-East Himalaya and Khasia Hills from 3,000 to 5,000 feet, collected by Kurz and T. Anderson in Sikkim, and by Griffith and G. Mann in the Khasia Hills.

This species is characterized by the large panicle, soft leaf, long ligule, and the absence or fewness of the transverse veinlets. It flowered in 1868 and 1876.

PLATE No. 5.—*Arundinaria polystachya*, Kurz. 1, leaf-branch; 2, flowering branch—*of natural size;* 3, spikelet; 4, flowering glume; 5, palea; 6, lodicules; 7, anther; 8, ovary and stigmas; 9, transverse venation of leaf—*enlarged.* (From Mann's Khasia Hills specimen No. 254.)

6. ARUNDINARIA DEBILIS, *Thwaites Enum. Plant. Zeyl.* 375.

A shrubby bamboo, apparently gregarious. *Culms* elongated, much branched, ·2 to ·8 in. in diameter; nodes rather enlarged; internodes 2 to 6 in. long, glabrous at the top or hispid with long hairs; the upper ones smooth, yellow, shining. *Culm-sheaths* not known. *Leaves* small, linear-lanceolate, glaucous, 1·5 to 3 in. long, ·2 to ·3 in. broad, acute or sub-truncate at the base with a short ·05 to ·1 in. petiole; very acute at the tip, and with a scabrous point; glabrous or hairy above, glabrous beneath; scabrous on one edge or both; main vein thick and prominent, secondary veins 2 to 3 pairs inconspicuous; intermediate 5, transverse veinlets few, distant, very inconspicuous, often wanting;

leaf-sheaths glabrous, striate, paleaceous, ending in a minutely ciliate callus, and furnished with a short auricle and a few (2 to 4) long pale bristles; *ligule* short. *Inflorescence* a terminal short leafy panicle with semi-verticillate, wiry branchlets; pedicels short, often obcuneate; rachis angular, glandular in the axils. *Spikelets* ·5 in. long, 3-flowered, glabrous or slightly pubescent, joints of the rachilla scabrous at the tip; *empty glumes* 2, the lower smaller, 5- to 7-nerved, ovate, mucronate; *flowering glume* longer but similar; *palea* bicuspidate, hirsute, ciliate at tip, keels not ciliate otherwise. *Lodicules* 3, ovate, acute, ciliate, 3-nerved. *Stamens* not exserted, anthers bifid at apex. *Ovary* ovoid, glabrous, produced into a short *style* which at once separates into two long purple *stigmas* beautifully plumose within. *Munro in Trans. Linn. Soc.* xxvi. 24; *Beddome Flora Sylv.* ccxxx. C. P. No. 1.

Ceylon at 6,000 to 8,000 feet, collected in the Central Provinces by Thwaites, also by Drs. Maxwell, Wight and G. Thomson.

This plant is characterized by the small pointed leaves, short spikelets, long glumes, and slightly ciliate palea. Thwaites says it is used in Newera Ellia as a fodder for horses.

PLATE No. 6.—*Arundinaria debilis*, Thw. 1, leaf-branch; 2, flowering branch —*of natural size;* 3, spikelet; 4 & 5, empty glumes; 6, flowering glume; 7, palea; 8, lodicule; 9, lodicules with stamens and stigmas; 10, anther; 11, ovary and stigmas; 12, transverse venation of leaf—*enlarged.* (All from Thwaites' specimens C. P. 1.)

7. ARUNDINARIA DENSIFOLIA, *Munro in Trans. Linn. Soc.* xxvi. 32.

A small, densely gregarious shrub, 6 in. to 3 ft. high, with stiff, strong, densely leafy branches arising from a thick rhizome covered with imbricating scales. *Culms* up to ·3 in. in diameter, smooth; nodes not prominent; internodes 1·5 to 3 in. long, walls rather thick. *Culm-sheaths* 1 in. or more long, striate, hirsute, slightly attenuate to a truncate top bearing very small pointed auricles; *imperfect blade* short, ovate, rounded at base; branchlets fastigiate, short, 5 to 8 from each node. *Leaves* densely imbricate, thick, almost sessile, lanceolate, acute; rounded or cordate at the base, tapering upwards gradually into a sharply acuminate glabrous point, 1 to 1·5 in. long by ·2 to ·3 in. broad, the edges broadly cartilaginous, finely spinulose-serrate; main vein prominent, thick, shining, secondary veins 1 to 2, inconspicuous, intermediate 4 to 5, transverse veinlets very numerous and regular; *leaf-sheaths* striate and with whitish stiff hairs above, ciliate on the edges, slightly so at the top; *ligule* short, rounded, hairy. *Inflorescence* a dense panicle of leafy branchlets, bearing racemes with 5 to 6 spikelets, the rachis angled, strigosely hairy. *Spikelets* ·4 to ·5 in. long, 1-flowered, with a terminal free rachilla or rudimentary flower; *empty glumes* 2, the lower short, narrow, lanceolate, acuminate, the midrib scabrous; the upper similar but broader, 5-nerved; *flowering glume* similar to but larger than the upper empty glume, 5-nerved, long mucronate, midrib conspicuous, scabrous; *palea* 2-keeled, scabrous on the keels, faintly 1-veined on either side, bimucronate; rachilla between empty and flowering glume rounded, glabrous. *Lodicules* obovate, obtuse, white, shortly fimbriate, faintly 3—5-nerved. *Stamens* not exserted; *anthers* long, blunt, shortly apiculate. *Ovary* elliptic, glabrous; *style* short, soon branching into 2 feathery *stigmas*. *Caryopsis* not seen.

South India and Ceylon: collected by Watson (No. 25); by G. Thomson in marshes on Pedrotallagalla; by Dr. Maxwell; and by Trimen on Horton plains at

7,200 ft. in September 1890 in flower. Also by Beddome in 1873 on Anemudi Hill. Anamalais, at 8,500 ft.

This is probably the smallest Indian species of bamboo, and it is characterized by the 1-flowered spikelets and short leathery imbricate leaves. Since the discovery by Trimen of the flowers, Munro's suggestion of its relationship to *A. Walkeriana* no longer holds good.

PLATE No. 7.—*Arundinaria densifolia*, Munro. 1, leaf-branch; 2, flowering branch—*natural size;* 3, culm-sheath—*somewhat reduced;* 4, raceme; 5, spikelet; 6 & 7, empty glumes; 8, flowering glume; 9, palea and imperfect terminal flower; 10, lodicule; 11, anther; 12, ovary and stigmas; 13, transverse venation of leaf—*enlarged.* (No. 1 from Thomson's specimen C. P. 3956; the rest from Trimen's specimens.)

8. ARUNDINARIA RACEMOSA, *Munro in Trans. Linn. Soc.* xxvi. 17.

An erect, gregarious shrub, with culms arising from long rhizomes. *Culms* 5 to 15 ft. high, ·7 to 1 in., and even 2 in. in diameter, bluish-green, glaucous when young; nodes marked by a ring; internodes 12 to 15 in. long, scabrous, rough above, walls thin; branchlets fascicled at the nodes. *Culm-sheaths* shorter than the internodes, usually 10 in. long, striate, covered with scattered black stiff hairs, ciliate at the edges, attenuate convexly at the top and truncate; *imperfect blade* 2 to 3 in. long, narrow, subulate, reflexed; *ligule* ·1 to ·2 in. long, fimbriate. *Leaves* linear-lanceolate, 4 to 7 in. long, ·5 to ·7 in. broad; rounded or attenuate at the base into a short ·1 in. petiole; ending above in a long setaceous point; glabrous above, sometimes with long hairs beneath, afterwards glabrous; scabrous-serrate on the edges; main vein yellowish, prominent; secondary veins 3 to 5 pairs; intermediate 5 to 7; transverse veinlets very numerous, regular, and conspicuous, raised beneath; *leaf-sheaths* straw-coloured, striate, sometimes hairy, ending in a somewhat ciliate membrane below the blade and bearing very short auricles with a few long stiff bristles; *ligule* short, blunt. *Inflorescence* a simple terminal panicle of close leafy verticillate branchlets which are surrounded by the persistent sheaths of fallen leaves; rachis glabrous; pedicels wavy, angular, 1 to 1·5 in. long. *Spikelets* in short racemes, 1 to 1·5 in. long, 4- to 8-flowered, the uppermost flower imperfect; *rachilla* clavate, flattened at the tip, ciliate on the edges and hairy on the articulation below the flowers; *empty glumes* 2, very small, acuminate, distant; *flowering glume* caudate-acuminate from a broad base, rough ciliate on the edges, point long scabrous, 7- to 9-nerved; *palea* shorter, bimucronate at the apex, ciliate on the keels, scabrous at tip, nerves none or scarcely visible. *Lodicules* 3, short, obtuse or one acute, short, fimbriate. *Stamens* hardly exserted; *anthers* long, purple, bifid at top, filaments short. *Ovary* oblong-ovoid, rounded, glabrous, produced into a short *style*, which is divided above the base into 2 or 3 papillose *stigmas*. *Caryopsis* ·2 to ·3 in. long, elliptic, acute, glabrous, furrowed on one side.

North-East Himalaya in East Nepal and Sikkim from 6,000 to 12,000 feet: collected many times in leaf, but in flower only by Dr. T. Thomson in 1857, and by G. A. Gammie and collectors of the Calcutta Botanic Garden in 1887 to 1890 at 10,000 feet, below Suburkum and Phalut on the Singalela Range.

This species is the common gregarious small bamboo of the Darjeeling upper forests, and it is there in universal employ as a fodder for cattle and ponies, especially

in the rainy season. The culms are also largely used in mat-making, for the roofs of native houses, for fences, and for garden supports. It is known as *Maling* (Nepalese); *Phyeum, miknu* (Lepcha); *Pheong, mheem* (Bhutia). Thomson gives also a Sikkim name, *Pummoon*, and Hooker the name *Pat-hioo* with specimens collected at Yalloong in Eastern Nepal at 10,000 ft. It is rarely in flower, and out of flower is difficult to recognize, but the hairy sheaths, fimbriate sheath ligules, and rough internodes may serve to identify it.

It grows to a comparatively large size in the forests below Tonglo and about Senchal in Darjeeling, but in these lower forests it has apparently never been collected in flower; for all the flowering branches seem to have come from the more or less stunted alpine form found above 10,000 feet. The natives distinguish this Alpine form under the names *miknu* and *mheem*, while the names *phyeum* and *pheong* are given to the larger lower-level form.

In regard to the difference between these two forms, Mr. G. A. Gammie in his Report on his botanical tour of 1892 on the Sikkim-Tibet frontier, says—"It is "what Mr. Gamble named *A. Gammieana* from specimens of the foliage only, but "having since examined flowers he has discovered it to be *A. racemosa*, Munro, a "plant which, although so abundant round Darjeeling as to be almost exclusively "used as fodder for ponies, has never been known to flower there. The Phalut "plant, which differs so much in size and appearance, having reddish stems with "an average height of 3 feet, may of course owe its diminution to the more "rigorous climate of higher levels preventing its attaining to a normal growth."

PLATE No. 8.—*Arundinaria racemosa*, Munro. 1, leaf-branch; 2, flowering branch; 3, culm—*of natural size;* 4, culm-sheath—*reduced about one-third;* 5, spikelet; 6, flowering glume; 7, palea; 8, lodicules; 9, lodicules with anthers, style and stigmas; 10, anther; 11, ovary, style and stigmas; 12, caryopsis; 13, transverse venation of leaf; 14, leaf-sheath of low level form; 15, leaf-sheath of high level form—*enlarged* (*Nos.* 1, 3, 4, 14 *from my own specimens, the rest from those of Calcutta Garden collectors.*)

9. ARUNDINARIA GRIFFITHIANA, *Munro in Trans. Linn. Soc.* xxvi. 20.

An erect, gregarious, thorny shrub. *Culms* 10 to 30 ft. high, 1 to 1·5 in. in diameter, olive-green; nodes prominent, bearing a circle of conical stout short spines; internodes 7 to 9 in. long, striate, furrowed, covered around the base of the node with a ring of tawny hairs. *Culm-sheaths* papery, striate, longer than the internodes, 6 to 9 in. long, 4 to 5 in. broad at base where they bear a belt of thick tawny soft hairs; gradually and somewhat convexly attenuate upwards to a breadth of about ·3 in., the apex furnished with rounded auricles, back covered thinly with scattered, stiff, bulbous-based hairs, edges ciliate; *imperfect blade* ·2 to 1 in. long, triangular, acute, hairy; *ligule* short, hairy, slightly ciliate. *Leaves* linear-lanceolate, acuminate, thin, 4 to 5 in. long, ·4 to ·5 in. broad, narrowed at the base into a ·2 in. short petiole; tip ending in a long, setaceous, somewhat scabrous point; smooth above, pale beneath, margins smooth; main vein pale, shining, conspicuous beneath, secondary veins 4 to 5 pairs, intermediate 4 to 5, transverse veinlets conspicuous, raised, straight; *leaf-sheaths* striate, glabrous, ciliate on the edges, ending in a narrow ring with a few stiff curved bristles; *ligule* moderately broad, hairy without. *Inflorescence* a terminal panicle, surrounded with sheathing

bracts, hairy at the base and ciliate on the edges, the spikelets in verticillate clusters on thin, wavy, scabrous, hairy pedicels; rachis hairy, flattened on one side. *Spikelets* 1 to 1·5 in. long, narrow, with 2 empty glumes and 4 to 6 flowers; rachilla long, ·2 to ·3 in., flattened, hairy, ciliate at the clavate top; *empty glumes* 2, ovate-lanceolate, mucronate, 5- to 7-nerved, scabrous, hairy on the back; *flowering glume* ·5 in. long, lanceolate, long mucronate, scabrous, hairy above, 7-nerved; *palea* nearly as long, bimucronate, 2-keeled, ciliate on the keels. *Lodicules* 3, obovate, faintly nerved, long ciliate, one rather shorter and narrower. *Stamens* apparently not exserted; *anthers* emarginate, the connective not produced, but the cells crowned with a few very fine white hairs. *Ovary* linear-oblong, glabrous, with a very short *style* and 2 long plumose *stigmas*. *Caryopsis* not known.

Khasia and Jaintia Hills of Assam: collected by Griffith at Moflong in 1835; by Hooker in 1850; by C. B. Clarke at Sohra, 4,500 ft. in 1872; and by G. Mann on the Mangot river near Jowai, Jaintia Hills, at 3,500 ft. in 1889 and at Nungklaw, Khasia Hills, at 3,000 ft. in 1890.

This species is distinguished from *A. callosa*, the other thorny species, by its quite different inflorescence, smaller leaves and peculiar culm-sheath. The woolly nodes of the culms and branchlets and the hairs on the apices of the anthers are, however, the best general characters. As stated by Munro, it seems to have only once been collected in flower, namely, by the Assam Deputation under Wallich and Griffith for the examination of the tea plant. The Khasia name is *Khnap* (G. Mann); but Mann's Khasia specimen bears the name *U-spar*, which is also that of *A. callosa*. The culms are used for tying the thatch of native houses.

PLATE No. 9.—*Arundinaria Griffithiana*, Munro. 1, leaf-branch; 2, flowering branch; 3, culm-sheath—*of natural size;* 4, spikelet; 5 & 6, empty glumes; 7, flowering glume; 8, palea; 9, lodicules; 10, anther; 11, ovary and stigmas; 12, leaf-sheath; 13, transverse venation of leaf—*enlarged.* (No. 3 from Mann's specimens; rest from Griffith's, kindly lent by the Director of the Royal Gardens, Kew.)

10. ARUNDINARIA CALLOSA, *Munro in Trans. Linn. Soc.* xxvi. 30.

A shrubby thorny bamboo. *Culms* 12 to 20 ft. high, ·5 to 1 in. in diameter, greyish-green, smooth, striate when young; nodes raised in a ring which is subtended by the base of the fallen sheath fringed with soft brown hairs, and which is studded with short thick conical spines, the said spines breaking through the sheath when the latter is detached; internodes 6 to 10 in. long, nearly solid at base, the walls higher up rather thin, (·15 in. in thickness). *Culm-sheaths* as long as or longer than the internodes, loose, thin, striate, smooth, transversely veined, ciliate on the edges, gradually attenuate upwards from a softly hairy base to a ·2 in. truncate tip; *imperfect blade* ·5 to 1 in. long, subulate, hairy without and within, decurrent on the sheath in long-fringed short auricles; *ligule* ·1 in., fimbriate. *Leaves* 8 to 9 in. long, ·7 to 1·3 in. broad, oblong lanceolate, thin; somewhat unequally attenuate at base into a ·1 to ·3 in. long petiole which is swollen at its base; ending above in a scabrous, acuminate point; finely glandular-scabrous above, especially on the marginal veins, pale and pubescent beneath, scabrous-serrate on the edges; main vein prominent, shining, hairy on the upper surface; secondary veins 5 to 8 pairs conspicuous; intermediate 5 to 6; transverse

veinlets many, prominent, regular, raised beneath with many pellucid glands; *leaf-sheath* striate, densely tawny-pubescent, at length glabrous, ciliate on the edges, ending in a shortly ciliate callus, and furnished with a few long stiff hairy curved bristles; *ligule* short, hairy, often fimbriate. *Inflorescence* a branched panicle ending in a leafy branchlet, the nodes of the panicle subtended by sheathing papery bracts; *rachis* striate, flattened on one side and bearing a vertical line of close pubescence, the end joints hairy, slender, clavate. *Spikelets* 2 to 3 in. long, subtended by straw-coloured glabrous narrow bracts; rachillæ very prominent, about ·2 in. long, curved, flattened, glabrous; flowers 6 to 12; *empty glumes* 2, short, glabrous, ovate-acute, 1- to 3-nerved; *flowering glume* ovate, acute, mucronate, ciliate at apex, 3- to 7-nerved; *palea* acute, 2-keeled, thickly pubescent, keels ciliate. *Lodicules* 3, ovate, faintly nerved, fimbriate, one smaller. *Stamens* slightly exserted, *anthers* short, blunt. *Ovary* ovate, glabrous; *style* short, speedily dividing into 2 shortly plumose *stigmas*. *Caryopsis* not known.

Eastern Himalaya and Khasia Hills in Assam, up to 6,500 feet; collected in 1850 by Hooker at Moflong and Myrung, 6,000 feet; by C. B. Clarke, in flower, in Shillong wood (No 37434), in March 1885; by G. Mann at Shillong peak in 1873 and at Myrung in 1890; and by J. L. Lister in 1875 in the Duphla Hills at Shergarh 6,800 feet and Singook 4,500 feet.

This species is easily distinguished from all others, except *A. Griffithiana*, by its spinous nodes, and from that species by the different inflorescence, longer and broader leaves, and less hairy and thinner sheaths. It grows in open clumps in evergreen forests, and is used for tying on the thatch of native houses. Hooker gives the Khasia name *Uskong*, while G. Mann gives those of *U-spar*, *spar*. For the flowers, which were unknown when Munro wrote, we are indebted to C. B. Clarke. Lister's specimens show excellently the characters of the culms and culm-sheaths.

PLATE No. 10.—*Arundinaria callosa*, Munro. 1, leaf-branch; 2, flowering branch; 3, part of culm—*natural size;* 4, culm-sheath—*reduced* $\frac{1}{3}$; 5, leaf-sheath; 6, spikelet; 7, empty glumes; 8, flowering glume; 9, palea; 10, lodicules; 11, flower, with glume and palea removed; 12, anther; 13, ovary and stigmas; 14, transverse venation of leaf—*enlarged.* (Nos. 3 and 4 from G. Mann's; the rest from C. B. Clarke's specimens.)

SECTION II.

11. ARUNDINARIA FALCATA, *Nees in Linnœa* ix. 478 (1834).

A gregarious shrub with annual culms from a central rootstock. *Culms* 6 to 10 ft. high, ·3 to ·6 in. in diameter, smooth, cylindric, green at first, and sometimes white pruinose; nodes much swollen, glabrous or hirsute; internodes 6 to 12 inches long, smooth, walls thin; branchlets from the nodes fasciculate, very numerous, slender, geniculate at the joints; flowering and leaf-bearing branches on different culms. *Culm-sheaths* papery, straw-coloured, striate, as long as or longer than the internodes, often 12 in. long and 3 in. broad at the base, glabrous above, minutely scabrous, hairy beneath in the upper half; ciliate on the edges; gradually and concavely attenuate upwards in the upper two-thirds to a narrow, truncate, ciliate, ·1 to ·2 in. broad tip; *imperfect blade* ·5 to 2 in. long, ·1 in. broad, subulate, recurved; *ligule* elongate, often ·5 in. long, dentate. *Leaves* usually 3 to 4 in. long and ·2 to ·3 in. broad; exceptionally (on young shoots) up to 12 in. long and 1 in. in

breadth, linear; attenuate at the base into a short, less than ·1 in. long, petiole; tapering above into a long setaceous twisted point; scabrous above, minutely pubescent beneath when young, afterwards glabrous or with scattered soft long hairs near the midrib, scabrous on the edges; main vein prominent, secondary veins 2 to 7 pairs, pale; intermediate 5 to 7; transverse veinlets none, but many pellucid glands, some of which give the appearance of transverse veinlets when dry; *leaf-sheaths* striate, glabrous, ending in a minutely hairy ring below the petiole, and produced upwards on either side to meet the ligule; *ligule* long, membranous, dentate or lacerate. *Inflorescence* on leafless separate culms, consisting of paniculate falcate racemes fascicled at the nodes, and subtended by short linear or lanceolate membranous bracts. *Spikelets* ·5 to ·7 in. long, bearing 2 empty glumes, then 1 to 2 fertile flowers, then a terminal rudimentary flower or free rachilla; rachillæ cuneate, hairy at the top; *empty glumes* 2, pale, the lower ·3 in. long 3- to 5-nerved, the upper ·4 in. long 7- to 9-nerved, acute, ciliate at tip; *flowering glume* ·5 in. long, sub-acute, mucronate, scabrous, 7- to 9-nerved, ciliate at tip; *palea* as long as or rather longer than flowering glume, bifid, 2-keeled, 2-nerved on either side of keels, keel ciliate at tip, margins of both flowering glume and palea often black. *Lodicules* ovate or obovate, one rather narrower, hyaline, somewhat swollen at base, 3-veined, fimbriate on the margins. *Stamens* at first hardly exserted, later protruding; *anthers* bifid at the tip, the filaments sometimes flattened. *Ovary* glabrous, linear-oblong, attenuate into a short *style*, which is speedily divided into 2 plumose *stigmas*. *Caryopsis* linear, ·5 in. long, furrowed on one side, surmounted by the base of the bifid style. *Ruprecht Bamb.* 25, tab. iii. 8; *Steudel Syn.* 335; *Munro in Trans. Linn. Soc.* xxvi. 26; *Brandis For. Flora* 562, *Ind. Forester* xii. 206. *A.* INTERRUPTA, *Trin. in Mem. Acad. Petersb. Ser.* vi. iii. ii. (1835) 620. *A.* UTILIS, *Cleghorn in Journ. Agr. Soc. of India* xii. 388 (1865) (?)

VAR *a.* *typica*, spikelets distant, in falcate filiform racemes.
„ *β.* *glomerata*, spikelets collected in groups of 3 to 4 together, in close racemes or panicles.

North-Western Himalaya, from the Ravi to Nepal, ascending from 4,000 feet to 12,000 feet, but rarely found over 7,000 feet, gathered by numerous collectors.

This is the well-known low level *ringal* of the North-Western Himalaya, always found in the undergrowth of forests of white oak (*Quercus incana*), firs and mixed trees in more or less shady places, usually on northern slopes or in ravines. It has been frequently found in flower, and though, as happened in 1879, years of general seeding are of occasional occurrence, a few clumps may be found in flower in almost any year. Brandis (*Ind. Forester* xii. 206) gives Chakrata 6,000 ft. in 1881; Manglad Valley 6,000 ft., 1881; Jaunsar 1878; Kulu 1876; and A. F. Broun (*Ind. Forester* xii. 414) gives Jaunsar 1886. Brandis says that "two kinds are "generally distinguished, one growing at lower elevations (up to 7,000 ft.), thinner, "with solid or nearly solid culms and narrow leaves; the other growing between 8,000 "and 12,000 ft. with shorter, thicker and hollow culms and broader leaves, the "foliage more feathery;" but in his paper in the "Transactions of the Royal Society of "New South Wales reprinted in *Ind. Forester* xii. 204," he seems to explain that the higher level one is *A. spathiflora*, Trin., for he has never seen *A. falcata* above 7,000 ft. He gives many vernacular names, the chief of which are *Nigal* and *Ringal.*

The culms are exported in considerable quantities to the plains, along with those of other species, to make hooka-tubes, fishing rods, &c., and in the hills they are used for basket work. This species is cultivated in Europe. It is recognized at once from *A. spathiflora* by the absence of transverse veinlets, and from its neighbour *A. khasiana* by the rather larger spikelets, loose inflorescence and generally narrower leaves. Nees describes the stigmas as 3, Ruprecht says '2 to 3', while Munro admits only 2. I can only find 2, but otherwise the identification seems good. I think it is doubtful whether the *A. utilis* of Dr. H. Cleghorn's 'Notes on the vegetation of the Sutlej Valley' in the Journal of the Agricultural and Horticultural Society of India, vol. xiii, p. 388, is this species. There is no description, and though Munro and Brandis have quoted it in their list of synonyms, the 'hill bamboo, at '9,000 feet, used for wicker work and for lining the roofs of houses' is just as likely to have been *A. spathiflora.*

PLATE No. 11.—*Arundinaria falcata,* Nees. 1, leaf-branch; 2, flowering branch; 3, rhizome and culm; 5, leaf from end of strong young shoot—*natural size;* 4, culm-sheath—*reduced* $\frac{1}{4}$; 6 & 7, spikelets; 8 & 9, empty glumes; 10, flowering glume; 11, palea; 12, rudimentary flower on terminal rachilla; 13, lodicule; 14, anther; 15, ovary and stigmas; 16, caryopsis; 17, transverse venation of leaf—*enlarged.* (Nos. 4, 5 from my own collecting; rest from a specimen in the Herbarium of the Botanic Gardens, Calcutta, bearing Munro's identification.)

PLATE No. 12.—VAR. *glomerata.* 1, leaf-branch; 2, part of flowering culm—*of natural size* (from specimens collected by C. Bagshawe, Deputy Conservator of Forests, in 1879).

12. ARUNDINARIA KHASIANA, *Munro in Trans. Linn. Soc.* xxvi. 28.

A thick, bushy shrub. *Culms* 8 to 12 ft. long, ·5 in. in diameter, smooth, dark green or almost black; nodes prominent; internodes 6 to 8 in. long; branchlets very many from the nodes, geniculate, dark-coloured, leaf- and flower-bearing culms separate. *Culm-sheaths* papery, straw-coloured, 6 to 9 in. long. by 1·5 to 2 in. broad at base, striate, smooth, upper part with transverse veinlets, upper half tapering gradually and concavely upwards to a narrow tip; *imperfect blade* narrower than apex of sheath, subulate, recurved, 1 in. long; *ligule* ·2 to ·3 in. long, subulate, dentate or lacerate. *Leaves* linear-lanceolate, 3 to 4 in. long by about ·3 in. broad; attenuate at the base into a short petiole; acuminate with a twisted setaceous point; smooth on both sides, or sometimes slightly pubescent beneath; scabrous on both edges; main vein prominent, secondary veins 2 to 3 pairs, with no, or very few, transverse veinlets, but many pellucid dots; *leaf-sheaths* thin, striate, ending in a minutely ciliate callus and slightly produced to meet the ligule; *ligule* rather long. *Inflorescence* on separate leafless culms, consisting of falcate, branching, geniculate panicles, fascicled at the nodes and subtended by membranous, short, ovate bracts. *Spikelets* ·4 to ·5 in. long, bearing 2 empty glumes, and usually 2 to 3 flowers with a terminal free rachilla or imperfect flower; rachis of spikelet clavate, white hairy above; *empty glumes* 2, short, the lower 3-, the upper 5- to 7-nerved, shortly mucronate and ciliate at the tip and on the margins below it; *flowering glume* similar, but longer and stiffer, sometimes minutely scabrous-pubescent; *palea* longer than the flowering glume, 2-keeled, glabrous except the ciliate tip, acute or bifid,

1-nerved on either side of the keels. *Lodicules* 3, ovate, obtuse, or one acute, fimbriate, 3- to 7-nerved, nerves brown. *Stamens* exserted, filaments somewhat flattened, *anthers* blunt at the apex. *Ovary* glabrous, elliptic, surmounted by a thickened *style* at once separating into two plumose *stigmas*. *Caryopsis* not known.

Khasia Hills in Assam at about 5,000 to 6,000 ft. Collected at Shillong by Griffith (No. 1058); at Churra and other places by Hooker in 1850; by Masters; and by G. Mann in 1889.

It is most difficult to separate this from *A. falcata;* but, as Munro remarks, it has a different look, and it is a plant of a stiffer and stronger general growth. After examining a large number of specimens of both species, I have come to the conclusion that the whole of the Assam material belongs to this species and that *A. falcata* is confined to the Western Himalaya. *A. khasiana* has a more dense and inbricated panicle, shorter flowers and a hairy rachis to the spikelet; the character of the hairs beneath the leaf given by Munro as belonging to *A. falcata* does not entirely hold good. It is known as *Namlang* in the Khasia Hills according to Hooker and G. Mann.

PLATE No. 13.—*Arundinaria khasiana*, Munro. 1, leaf-branch; 2, flowering branch; 3, leaf-sheath—*natural size;* 4, culm-sheath—*reduced to* ¼; 5, part of panicle; 6, spikelet; 7 & 8, empty glumes; 9, flowering glume; 10, palea and imperfect flower; 11, lodicules; 12, anther; 13, ovary and stigmas; 14, transverse venation of leaf—*enlarged.* (All from Griffith's specimens, except No. 4 which is from those of G. Mann.)

13. ARUNDINARIA INTERMEDIA, *Munro in Trans. Linn. Soc.* xxvi. 28.

A thin, cæspitose, gregarious shrub. *Culms* smooth, greyish-green, 8 to 12 ft. high, ·4 to ·5 in. in diameter; nodes swollen, with a prominent ring and a whitish line below them; internodes 5 to 10 in. long, walls ·1 to ·2 in. thick; branches many from the nodes. *Culm-sheaths* glabrous, papery, strongly striate, 8 to 10 in. long by 1 to 2 in. broad at the base, tapering evenly in the upper third to a truncate tip ·1 to ·2 in. broad, ciliate below the blade and produced beyond it to meet the ligule; *imperfect blade* narrow, subulate, ·5 to 2 in. long, recurved; *ligule* up to ·2 in. long, blunt. *Leaves* bright green, very variable, from 8 in. long and 1 in. broad in young shoots to 3 to 4 in. long and ·5 in. broad in the slender branchlets from the nodes, linear-lanceolate to oblong-lanceolate; attenuate at the base into a short swollen petiole about ·1 in. long; acuminate above in a setaceous point; scabrous above and on both margins, pale and smooth or hairy near the midrib beneath; main vein prominent, shining beneath, secondary veins 3 to 7 on either side; intermediate 6 to 7; transverse veinlets few, distant, with few pellucid glands between; *leaf-sheaths* striate, glabrous or with scattered long stiff hairs above, ending in a thickened minutely ciliate callus below the petiole and produced at the side into falcate auricles bordered with curving stiff deciduous bristles; *ligule* elongate, obtuse or triangular. *Inflorescence* on leafless stems consisting of racemose panicles verticillate from the nodes and of variable length, subtended by membranous bracts; rachis smooth, dark, with small triangular bracts below and sometimes a tuft of hair above at the axils. *Spikelets* ·5 to 1 in. long, yellow or purplish, with 2 empty glumes, 3 to 5 flowers and a terminal free rachilla or imperfect flower; rachillæ between the flowers clavate,

compressed, long ciliate above; *empty glumes* 2, pale, ovate, membranous, the lower 3- to 5-, the upper 7- to 9-nerved, blunt or acute, ciliate at tip; *flowering glume* similar but shortly mucronate, nerves 7 to 9, conspicuous, often minutely scabrous on the back; *palea* longer than flowering glume, bi-mucronate, 2-keeled, ciliate on the keels, 2-nerved between, 1-nerved on either side of them. *Lodicules* 3, ovate, of various sizes, fimbriate, thickened and 3- to 7-nerved at base. *Stamens* slightly exserted; *anthers* blunt or very slightly pointed at the apex. *Ovary* linear-oblong, glabrous, ending in a short *style*, divided near the base into two plumose *stigmas*. *Caryopsis* short, oblong, swollen in the middle and furrowed in front, tipped with the persistent base of the style.

Eastern Himalaya: lower hills of Sikkim up to 7,000 ft., chiefly on dry ridges, as on those above Sivoke: collected in flower by Hooker in 1848; by T. Anderson in 1868; and by myself in 1879; also in leaf by Kurz at Goke, 4,000 ft.; by T. Thomson and G. A. Gammie. Cultivated in Calcutta, the Nilgiris, and elsewhere.

This species is not easy to recognize from the flowers, but it usually has 4 or 5 fertile flowers, while *A. falcata* and *A. khasiana* have rarely more than 2. The beautifully long ciliate leaf-sheath is, however, an excellent character. It is called *Nigala, titi nigala* (Nepalese), *Parmiok* (Lepcha), and the culms are strong and make fishing rods, baskets, mats, etc. It is an excellent hedging plant.

PLATE No. 14.—*Arundinaria intermedia,* Munro. 1, leaf-branch; 2 & 3, flowering branches—*of natural size;* 4, culm-sheath—*reduced* to ½; 5, leaf-sheath; 6, spikelet; 7 & 8, empty glumes; 9, flowering glume; 10, palea and imperfect flower; 11, lodicule; 12, anther; 13, ovary and stigmas; 14, transverse venation of leaf—*enlarged.* (All from Hooker's specimens, except No. 4 from my own.)

14. ARUNDINARIA HOOKERIANA, *Munro in Trans. Linn. Soc.* xxvi. 29.

A handsome, rather tall, cæspitose bamboo. *Culms* 15 to 20 feet high, slender, glaucous-green with whitish scurf when young; when older with a dark bluish ring at the top of each internode, often striated green and yellow; ·7 to 1·5 in. in diameter; nodes not much swollen, but prominently ringed by the persistent base of the sheath; internodes to 8 in. long, fistular, walls thin, (·1 in. in thickness); branchlets chiefly from the upper nodes, short, those bearing leaves and flowers respectively on different culms. *Culm-sheaths* papery, striate, often 12 to 24 in. long and 3 to 6 in. broad at base, concavely attenuate upwards in the upper half to a truncate point below the imperfect blade and produced on either side beyond it to a point to meet the ligule; *imperfect blade* linear, ·2 to ·3 in. broad, 3 to 6 in. long; *ligule* ·1 to ·2 in. long, dentate or lacerate, depressed in the middle, curved upwards at the edges. *Leaves* linear- to oblong-lanceolate, glaucous-green when young, 6 to 12 in. long by ·5 to 1·5 in. broad; attenuate at the base into a ·1 to ·2 in. long petiole; acuminate in a scabrous setaceous point; somewhat rough above, pale and glabrous beneath except for a few white hairs round the midrib at the base; margins scabrous; main vein prominent beneath, shining; secondary veins 4 to 8 pairs; intermediate 5 to 7, no proper transverse veinlets, but many pellucid glands giving the appearance of oblique transverse veinlets on the under surface when dry; *leaf-sheaths* striate, glabrous but minutely ciliate at the edges, ending in a broad callus and thin membrane without bristles; *ligule* long,

conspicuous, often of dark colour and pointed. *Inflorescence* of loose, falcate, racemose panicles fascicled at the nodes of a leafless culm, bracteate at base; rachis dark, smooth, rounded, geniculate, ultimate branchlets filiform, wavy. *Spikelets* about ·35 in. long, pedicellate, drooping, with 2 empty glumes, 1 fertile flower and a terminal free rachilla or imperfect flower, hard, somewhat scabrous; *empty glumes* 2, oblong, thin, membranous, the lower about ·1 in., the upper about ·2 in. long; the lower 3-nerved, hairy at tip, the upper 5-nerved, mucronate; *flowering glume* large, hard, broadly ovate, involute, angled, with 3 prominent nerves, scabrous between them; *palea* thick, 2-keeled, glabrous, its tip somewhat prolonged, hirsute. *Lodicules* 3, thickened at base and coloured, obovate, acute or rounded, thin, fimbriate, 3—5-nerved. *Stamens* exserted, anthers sub-acute. *Ovary* ellipsoid glabrous, surmounted by a short style, early dividing into 2 rather short plumose stigmas. *Caryopsis* elliptic, ·3 in. long, dark, smooth, tipped with the pointed base of the style.

Eastern Himalaya in Sikkim and Bhutan: collected by Hooker at Yoksun, 4,000 to 6,800 ft. in 1848; again in flower by R. Pantling, of the Calcutta Botanic Garden, at Choongthang, 5,600 ft., in 1885; and by G. A. Gammie in the Gheet Valley, British Bhutan, 6,000 ft., in 1892.

This is a very pretty species which ought to be cultivated, and should thrive well in places in Europe which are sheltered from frost. It is known as *Singhani* (Nepalese); *Prong* (Lepcha). The large leaves, bluish thin-walled culms and spikelets with 1 flower distinguish it easily.

PLATE No. 15.—*Arundinaria Hookeriana*, Munro. 1, leaf-branch; 2, flowering branch; 3, node of culm—*natural size;* 4, culm-sheath—*reduced to* ½; 5, imperfect blade and ligule of culm-sheath, under surface—*natural size;* 6, leaf-sheath and ligule; 7, spikelet; 8 & 9, empty glumes; 10, flowering glume; 11, palea and stamens with imperfect flower; 12, lodicules and ovary with stigmas; 13, caryopsis—*enlarged*, (Nos. 3, 4, from my own specimens, No. 5 from Mr. G. A. Gammie's, the rest from Mr. R. Pantling's).

SECTION III.

15. ARUNDINARIA SPATHIFLORA, *Trin. in Mem. Acad. Petersb. Ser.* vi. iii. ii (1835), 617.

A gregarious, cæspitose, shrubby bamboo. *Culms* 12 to 20 feet high, ·5 to ·8 in. in diameter, smooth, glaucous-green with white scurf at first, afterwards turning yellow and even reddish-brown, upper joints darker coloured; nodes prominent, but not much raised, marked by a whitish ring; internodes 6 to 15 in. long; branchlets chiefly from upper nodes, much jointed and bearing straw-coloured sheaths at the joints. *Culm-sheaths* loose, glabrous, coriaceous, straw-coloured, striate without, very smooth within, ciliate on the margins, the edges parallel till near the top, where they are slightly narrowed convexly into a truncately rounded mouth ·5 to ·7 in. broad and with a few stiff bristles; *imperfect blade* 2 to 4 in. long by about ·3 in. broad, subulate, erect, decurrent on the sheath; *ligule* ·1 in. broad, fimbriate. *Leaves* clustered in groups of 2 to 4 at the ends of short-jointed branchlets which bear loose, narrow, yellow sheaths, 3 to 5 in. long, ·4 to ·6 in. broad, linear-lanceolate, attenuate at base into a ·1 to ·2 in. long petiole; ending above in an acute hairy point; smooth on both surfaces, sometimes slightly hairy below, scabrous on both margins; main vein narrow, not prominent, secondary veins 3 to 5 pairs, intermediate 5 to 7, transverse veinlets very prominent and regularly tessellate, raised beneath, sometimes oblique; *leaf-sheaths* loose, 2-3 in.

long, straw-coloured, striate, ciliate on one edge, truncate at top in a narrow ciliate callus and bearing short auricles furnished with few long purple bristles; *ligule* long, dark-coloured, ciliate. *Inflorescence* usually on separate leafless culms, but sometimes with flowers and leaves intermixed, branches many, fascicled, drooping, paniculately racemose; rachis very slender, much jointed, bearing at the joints papery, straw-coloured, narrow (·2 to ·3 in.) sheaths 1·5 to 3 in. long, truncate or ending in a small leafy, subulate, imperfect blade, which enclose 2 to 3 pedicellate (or one sessile) spikelets. *Spikelets* loose, compressed, 1 to 2·5 in. long, bearing 2 empty glumes and 4 to 8 fertile (or the last imperfect) flowers; rachillæ long-clavate, white—hairy at tip; *empty glumes* 2, linear-lanceolate; one rather blunt, short, the other long, mucronate, membranous, striate, glabrous; *flowering glumes* ovate, long-acuminate, mucronate, ·6 to 1 in. long, scabrous, striate; *palea* much shorter than flowering glume, 2-keeled, ciliate on the keels, sometimes bifid, 1- to 2-nerved outside, 1-nerved between the keels. *Lodicules* 3, ovate-falcate or ovate-acute, 3—5-nerved, fimbriate. *Stamens* long exserted, *anthers* blunt. *Ovary* glabrous, ovoid, elongate, surmounted by a short *style* which at once divides into 3 long, plumose, recurved *stigmas*. *Caryopsis* linear-oblong, glabrous, furrowed on the back. *Species Graminum* iii. tab. 350; *Ruprecht Bamb.* 24, tab. ii. fig. 5; *Steudel Syn.* 334; *Brandis in Ind. Forester* xii. 206. A. PROCERA, *Wall. MS. in Herb. Mus. Brit.*, *fide Munro.* THAMNOCALAMUS SPATHIFLORUS, *Munro in Trans. Linn. Soc.* xxvi. 34 *Brandis For. Flora* 563. "Genus novum *Bambusæ affine*," Wall. Cat. 5041. "BAMBUSA MACRO—," Wall. MS. in Herb. Kew.

Mountains of the North-West Himalaya from the Sutlej to Nepal, above 7,000 feet, first collected in flower by Wallich in 1821, and since then by Brandis in 1879 (?), by W. R. Fisher in Jaunsar in 1882, and by myself at Deoban, 9,000 ft., in 1892, and on Kedarkanta in Tehri-Garhwal, 9,000 ft., in 1893.

This is the common high level *ringal* of the North-West Himalaya, common in the undergrowth of the deodar and fir forests in moist localities. It usually flowers gregariously as it did in 1882 (see A. F. Broun in *Ind. Forester*, vol. xii. p. 414, fig. 1), the seedlings from which flowering are now (1893) growing up. But isolated old flowering clumps may be occasionally met with, such as those I found in 1892 and 1893. It is at once distinguished from *A. falcata* by its prominent transverse veinlets; from *A. jaunsarensis* by its short rhizomes and cæspitose growth; and from *A. aristata*, (to which I refer all the Eastern Himalayan specimens hitherto assigned to this, and which is very nearly allied to it,) by the narrower bracts with fewer spikelets, the absence of a hairy callus to the leaf-sheath, and other minor points. The culms are used for pipe-stems, basket-work, pea-sticks and other purposes.

PLATE No. 16.—*Arundinaria spathiflora*, Trin. 1, leaf-branch; 2, flowering branch; 3, part of young shoot with culm-sheath—*natural size;* 4, culm-sheath—*reduced to* ½; 5, leaf-sheath—*much enlarged;* 6, spikelet and bract; 7 & 8, empty glumes; 9, flowering glume; 10, palea; 11, lodicules; 12, anther; 13, ovary and stigmas; 14, transverse venation of leaf—*enlarged.* (Nos. 1, 3, 4, 5, 6, from my own specimens, rest from Wallich's Nepal specimen.)

16. ARUNDINARIA ARISTATA, *n. sp. Gamble.*

A gregarious cæspitose shrub. *Culms* strong, glaucous-green and white-scurfy at first, afterwards a shining yellow, 8 to 12 ft. high by ·5 to ·6 in. in diameter; nodes

not much swollen, but prominent on account of the persistent cup-like base of the fallen sheath; internodes 8 to 12 in. long, walls hard, over ·1 in. in thickness; branchlets very many from the nodes, either all flowering and all leaf-bearing, or bearing both flowers and leaves together, joints short, reddish in colour, nodes prominent, bearing straw-coloured loose dry sheaths. *Culm-sheaths* 6 to 8 in. long, 2·5 to 3 in. broad at base, gradually attenuate upwards convexly to a ·3 in. broad truncate point which is slightly ciliate; base with a thick ring of soft hairs, back sparsely covered with long bristles with bulbous bases; *imperfect blade* 1 to 1·5 in. long, ·1 to ·2 in. broad, subulate, hardly decurrent; *ligule* short, minutely pubescent. *Leaves* in terminal sets of 2 to 3, on much-jointed, loose-sheathed, purple branchlets, oblong-lanceolate, attenuate at the base into a ·2 in. long glandular petiole, ending above in a twisted setaceous point; glabrous but roughish on both surfaces, or faintly hairy beneath, scabrous on one edge; main vein narrow, shining, carried into the petiole, secondary veins 3 to 5 pairs, intermediate 5 to 7, transverse veinlets very prominent and regularly tessellate; *leaf-sheaths* loose, striate, 2 to 3 in. long, keeled, ending each side in a thickened shaggy callus below the petiole, and produced upwards at the margin to meet the ligule, and then bearing a few (6—8) long stiff purple bristles; *ligule* long, acute or truncate. *Inflorescence* of many paniculate racemes clustered at the nodes of the culm, the joints of the branchlets bearing a large spathaceous bract enclosing 3 to 5 spikelets with short pedicels; rachis smooth, slender, jointed; bract 1·5 to 2 in. long and ·4 to ·5 in. broad, reddish-brown or yellowish, ending in a fimbriate mouth and bearing a leaf like imperfect blade. *Spikelets* 1 to 2 in. long with 2 empty glumes and 4 to 8 fertile flowers, compressed; rachillæ clavate, curved, minutely white ciliate below the joint; *empty glumes* 2, pale, membranous, oblong-lanceolate, scabrous, mucronate, keeled, 5—7-nerved, glabrous; *flowering glumes* ovate, long acuminate, dark-coloured, scabrous-hirsute, prominently 9-nerved; *palea* nearly as long as flowering glumes, 2-keeled, minutely ciliate on the keels, ovate acuminate, usually bimucronate, scabrous, 2-nerved between and 2-nerved on either side of the keels. *Lodicules* lanceolate, acute, thickened below, 3-nerved, ciliate. *Stamens* exserted, *anthers* purple, blunt. *Ovary* ovate, surmounted by a short *style*, speedily dividing into 3 feathery *stigmas*. *Caryopsis* dark brown, linear-oblong, glabrous, furrowed on the back, acute. THAMNOCALAMUS SPATHIFLORUS, *Munro in Trans. Linn. Soc.* xxvi. 34 (*partly*).

North-Eastern Himalaya in Sikkim and British Bhutan, especially on the Singalila Range above 10,000 ft.: collected in flower by Kurz in 1868; by C. B. Clarke at Yakla, 11,000 ft., in 1869; by C. G. Rogers at Tonglo, 10,000 ft.; and by G. A. Gammie at Phalut, 10,000 ft. in 1890. Leaf specimens have also been collected by H. C. Levinge, Kurz, G. King, myself and others in Sikkim, and above Chupcha in woods at 9,500 to 10,000 ft. by Griffith in Bhutan.

This species comes very near to *A. spathiflora*, but after careful examination of several specimens I have come to the conclusion that it is specifically distinct, and that all the East Himalayan specimens placed by Munro under *A. spathiflora* belong to *A. aristata*. It is a beautiful and interesting little bamboo, and differs in habit from *A. spathiflora* also in having broader bracts, enclosing several spikelets, shorter leaves, a hairy callus below the petiole which is longer, longer mucros to the flowering glumes, and a more acuminate palea which is nearly as long as the flowering glume. G. A. Gammie gives the name as *Bhébham* (Bhutia), *Babain* (Lepcha). On the hills of Sikkim this species is easily recognized by the yellow culms and reddish branchlets.

PLATE No. 17.—*Arundinaria aristata*, Gamble. 1, leaf-branch; 2, flowering branch; 3, young shoot showing culm-sheaths—*of natural size;* 4, leaf-sheath; 5; bract with spikelet; 6, spikelet spread out—*much enlarged;* 7, palea; 8, lodicules; 9, anther; 10, ovary and stigmas; 11, transverse venation of leaf—*enlarged.* (No. 1 from H. C. Levinge's specimen; rest from C. B. Clarke's.)

17. ARUNDINARIA FALCONERI, *Bth. and Hook. fil. Gen. Pl.* iii. 1208.

A tall shrubby bamboo. *Culms* fistular, probably 12 to 15 ft. high, ·6 to ·8 in. in diameter, smooth when young, covered with white scurf when old, frequently striped yellow and green; node raised at the joint and marked below it by the persistent base of the fallen sheath; internodes 8 to 15 in. long, walls ·15 in. thick, branches many from the nodes, fistular, joined with bracteate sheaths. *Culm-sheaths* striate, hairy when young, papery, straw-coloured when older, sometimes striped, 8 to 12 in. long, 2 to 3 in. broad, ciliate on the edges, narrowed only at the top convexly into a truncate ·3 to ·4 in. broad mouth; *imperfect blade* subulate, recurved, 3 to 5 in. long, ·2 to ·3 in. broad; *ligule* narrow, dark-coloured, hairy. *Leaves* soft, thin, dull green, oblong-lanceolate, 3 to 6 in. long, ·5 to ·8 in. broad, rounded or narrowed at the base into a ·1 in. long petiole; smooth on both surfaces, scabrous on the edges; main vein not prominent, secondary veins 3 to 4, inconspicuous, intermediate 5 to 7, no regular transverse veinlets, but few pellucid glands having that appearance beneath; *leaf-sheaths* glabrous, striate, ciliate on the edges, ending in a minutely ciliate narrow callus below the petiole; *ligule* rounded, hairy, elongate. *Inflorescence* in large leafy panicles with racemose branchlets, bearing, clustered at the nodes of a slender geniculate rachis and supported by 2 to 4 or more chaffy bracts, one or more racemes of spikelets 1 in. long; bracts ovate-lanceolate, up to 1 in. long, truncate at tip or with a very small imperfect blade; rachis of raceme sinuously curved, flattened. *Spikelets* 5 to 7 in the raceme; 1-flowered with a terminal free rachilla bearing a very minute imperfect flower; rachilla with a ring of hairs below the flowering glume; *empty glumes* 2, membranous, oblong, acute or mucronate, 3- to 5-nerved, the midrib prominent, more than half the length of the spikelet; *flowering glumes* ovate-lanceolate, 5—7-nerved, shortly mucronate, ciliate at the tip; *palea* as long or longer, 2-keeled, keels glabrous except at the very tip, shortly bi-mucronate, 1-nerved on either side of keel. *Lodicules* 3, oblong, or obovate, acute, 3—5-veined, ciliate on the edges, one rather shorter and smaller. *Stamens* exserted, *anthers* obtuse or very shortly apiculate, purple. *Ovary* ovate, glabrous, elongated into a thick *style*, which is finally divided into 3 long plumose *stigmas*. *Caryopsis* linear-oblong, furrowed on one side, shortly acute. THAMNOCALAMUS FALCONERI, *Hook. fil. MS.*, *Munro in Trans. Linn. Soc.* xxvi. 34; *Brandis For. Flora* 563 BAMBUSA FLORIBUNDA, *Munro in Herb. Trin. Coll. Dubl.* " BAMBUSOIDES, " *Wall. Cat.* 5040.

Himalayan range from Kumaon to Bhutan: collected by Wallich in Nepal in 1821; by Strachey and Winterbottom at the Madhari Pass, Kumaon, 8,000 ft.; by Dr. Jamieson (Saharanpur Garden collection); by C. B. Clarke in Sikkim at Laghep, 9,000 ft., in 1876 (No. 27760); by T. Anderson at Senchal, Darjeeling, 7,000 ft., in 1868; by G. A. Gammie at Tendong, 7,000 ft., and by myself near Darjeeling.

This species is very little known: it is clearly a Nepalese kind chiefly, and only just extends eastwards into Bhutan and westwards into Kumaon. The dates of flowering are given by Wallich's collection of 1821 and C. B. Clarke's of 1876.

T. Anderson's specimens bear the name *Pummoon* (Lepcha and G. A. Gammie's that of *Pao múng*, which presumably is the same. The small sheaths enclosing short sinuous racemes of 1-flowered spikelets, with the absence of regular transverse veins to the leaves, at once characterize this species. Judging from the figure and description, this is the *A. falcata*, Nees, of Rivière's 'Les Bambous,' page 308. It is regularly cultivated in Europe, and, according to a letter by Dr. M. T. Masters in *Nature* of January 20, 1881, flowered gregariously a few years previously.

PLATE No. 18.—*Arundinaria Falconeri*, Bth. and Hook. fil. 1, leaf-branch; 2, flowering branch—*of natural size;* 3, culm-sheath—*reduced to* ½; 4, bracts and raceme of spikelets; 5, spikelet; 6 & 7, empty glumes; 8, flowering glume; 9, palea; 10, lodicules; 11, anther; 12, ovary and style with stigmas; 13, caryopsis—*enlarged*. (No. 3 from G. A. Gammie's, rest from C. B. Clarke's specimens.)

SECTION IV.

18. ARUNDINARIA PRAINII, *Gamble*.

A small wiry climbing shrub. *Culms* thin, slender, smooth, yellowish, curving, up to 30 ft. long, ·2 to ·3 in. in diameter; nodes swollen in a well-marked ring; internodes short, usually 8 to 9 in. long, longer in the middle, decreasing upwards, walls thick, often quite solid, branchlets fasciculate from the nodes, the leaves becoming smaller upwards and finally very much reduced, aciculate. *Culm-sheaths* thin, somewhat scabrous above, 2 to 6 in. long, ·4 to ·8 in. broad, attenuate convexly in the upper half to a very narrow point; *imperfect blade* short, ·1 to ·2 in., needle-like; *ligule* short, rounded. *Leaves* small, thin, oblong-lanceolate, 2 to 4 in. long, ·3 to ·7 in. broad; rounded at the base into a short ·1 in. long petiole; ending above in long curved setaceous points glabrous on both sides; one edge scabrous; main vein scarcely prominent, secondary veins 2 to 3 pairs, intermediate 4 to 7, transverse veinlets none; *leaf-sheath* striate, smooth, ending in a prominent glabrous callus below the petiole and produced upwards at the sides; *ligule* long, rounded, blunt. *Inflorescence* in terminal or axillary panicles bearing distant spikelets in the axils of sheath-like straw-coloured bracts; *rachis* very slender, wiry, smooth, geniculate. *Spikelets* 1 to 1·4 in. long, on slender pedicels, bearing 2 to 3 empty glumes, 3 to 6 fertile flowers and a terminal imperfect flower, distichously arranged on alternate sides of a wiry flexuouse rachis; rachillæ clavate, flattened; *empty glumes* usually 2, the lower 1-keeled, ciliate on the edges, lanceolate, the upper ovate, acute, 3—5-nerved, ciliate on the tip; *flowering glumes* triangular, falcate, acute, glabrous, 9- to 11-nerved, nerves prominent; *palea* falcate, as long as flowering glume, 2-keeled, minutely ciliate on the keels, and at the acute or bifid apex. *Lodicules* 3, two broadly ovate, 3-nerved, faintly ciliate, the third lanceolate acute, 1—3-nerved. *Stamens* 6, hardly exserted, anthers purple, bluntly apiculate. *Ovary* oblong, hairy above; *style* thick, bulbous at the base, papillose; *stigmas* 3, plumose. *Caryopsis* not known. MICROCALAMUS PRAINII, *Gamble in Journ. As. Soc. Bengal, Vol.* lix *ii.* 207, *Pl.* vii.

Naga and Jaintia Hills in Assam, found by Dr. D. Prain in flower at Pulinabadza, 7,870 ft., Naga Hills, in 1886, on the edge of a precipice; and by G. Mann on the Jarain road, about 5½ miles from Jowai, Jaintia Hills, 3,500 ft., in 1889. I also identify with this the specimens collected by Mr. James Rollo in the Zulla Valley, Naga Hills, 5,400 ft., in 1891.

This graceful little climbing bamboo has 6 stamens, and, under the impression that the character given by Bentham and Hooker to the section *Triglosseæ* was permanent, I described it as a new genus, *Microcalamus*, in 1890. It appears, however, from a note by Professor D. Oliver to plate 1969 of Hooker's 'Icones Plantarum,' that not only was the name *Microcalamus* already pre-occupied, but that the authorities at Kew saw nothing to prevent bamboos having the other characters of *Arundinaria* being described under that genus in spite of a larger number of stamens, so that I do not hesitate now to transfer my plant to *Arundinaria.* I cannot, however, agree with Professor Oliver in referring *A. Prainii* to *A. kurilensis*, Ruprecht; for I can trace no points of agreement except those of the 6 stamens and spikelets with about the same number of distichous flowers. G. Mann gives the Naga name as *Sampit*, and says that the plant is used for basket-work and for building huts. Mr. Rollo gives the Naga name *Kevva.*

PLATE No. 19.—*Arundinaria Prainii*, Gamble. 1, 2, 3, flowering and leaf-bearing branches from different parts of culm; 4, culm-sheath—*of natural size;* 5, spikelet and bract; 6, flower open; 7, flower open with glume and palea removed; 8, lodicules; 9, anther; 10, ovary and stigmas; 11, venation of leaf—*enlarged.* (No. 4 from Mann's, rest from Prain's specimens.)

SPECIES OF WHICH THE FLOWERS ARE NOT KNOWN.

19. ARUNDINARIA MICROPHYLLA, *Munro in Trans. Linn. Soc.* xxvi. 32.

A gregarious, low, cæspitose shrub. *Culms* 2 to 4 ft. high; internodes 2 to 3 in. long, very glabrous; branches many from the nodes, semi-verticillate. *Culm-sheaths* not known. *Leaves* small, narrow, linear-lanceolate or almost lanceolate, acute, ·1 to ·2 in broad, under 1 in. long, shortly mucronate, the margin almost membranaceous, fimbriate or glabrous; *leaf-sheath* often dark-coloured, striate, hairy above, long fimbriate at the top; secondary veins 2 pairs, hardly conspicuous, transverse veinlets many, not raised; *ligule* scarcely visible. BAMBUSA MICROPHYLLA, Griffith Journ. i. 242, 259, &c.

Bhutan: collected by Griffith at Sanah, 7,000 ft., and at other places between 6,000 and 10,000 ft.

It is possible that C. B. Clarke's No. 38980, collected at Soyung, 5,600 ft., Khasia Hills, in 1885, described as dwarf, and said to be used for pony fodder, may be this species, but the leaves are larger. Griffith describes *A. microphylla* as a dwarf plant, 'forming large patches in wet places' and clothing the sward on the Dhong-laila Pass at 10,000 ft.

No plate available—description after Munro.

20. ARUNDINARIA HIRSUTA, *Munro in Trans. Linn. Soc.* xxvi. 30.

A small shrubby bamboo with single stems from the rhizome. *Culms* greyish-green, 4 to 8 ft. high, ·2 to ·3 in. in diameter, nodes glabrous, raised; internodes up to 13 in. long, often strigosely hirsute above, walls rather thin. *Culm-sheaths* thin, papery, about 6 in. long and 1 in. broad at base, striate, covered with long brown hairs, rounded at top and ending in large, recurved, long-ciliate auricles; *imperfect blade* subulate, acuminate, recurved; *ligule* narrow, pubescent. *Leaves* oblong-lanceolate, 3 to 5 in. long

by ·5 to ·7 in. broad; rounded at base into a short, ·1 in. long, broad petiole; tip a subulate, twisted, scabrous point; smooth above, pale and strigosely white hairy beneath; edges cartilaginous and scabrous serrate; main vein narrow, shining, secondary veins 4 to 6 pairs, intermediate 7, transverse veinlets very numerous, straight, regular and strong; *leaf-sheaths* striate, covered with long stiff bristles ending in a hairy callus and rounded, reflexed auricle bearing long, stiff, almost spinescent hairy bristles; *ligule* elongate, hairy, often of dark colour. *Inflorescence*, etc., unknown.

Khasia and Naga Hills at 5,000 and up to 9,500 ft.: collected by Griffith on rocks at Myrung, 5,600 ft.; by Hooker in 1850 in woods at Syung, 5,700 ft., and Moflong, 6,000 ft.; by G. Mann at Myrung in 1890 under the Khasi name *U-stoh*, and by C. B. Clarke at Shillong (No. 44651) and at Jakpho, Naga Hills, 9,500 ft., (No. 51313) in 1885-86.

This pretty bamboo much resembles *A. Wightiana*, and might almost be placed under it except for the very marked auricles and bristles of the culm- and leaf-sheaths. Mann says it is used for the walling of huts to hold the mud plaster. Munro refers to Hooker's having described it as possessing spinous stems, but says he has found no trace of spines unless the very stiff leaf-ciliæ were referred to.

Plate No. 20.—*Arundinaria hirsuta*, Munro. 1, leaf-branch—*of natural size*; 2, culm-sheath—*reduced to* ½; 3, transverse venation of leaves—*enlarged*. (Nos. 1, 3 from C. B. Clarke's specimen; No. 2 from G. Mann's.)

21. Arundinaria Gallatlyi, *n. sp. Gamble.*

A small gregarious shrub. *Culms* thin, branches smooth, glabrous, striate, sometimes channelled; sheaths of branchlets narrow, papery, with foliaceous imperfect blades and long ligules. *Leaves* oblong-lanceolate, acuminate, pale green, 3 to 4 in. long by ·6 to ·8 in. broad; attenuate at the base into a short, ·1 in. petiole; ending in a scabrous, setaceous point; smooth above, whitish beneath; scabrous on one edge; main vein slender, shining, secondary veins 3 pairs, intermediate 5 to 6, transverse veinlets numerous, fine, regular; *leaf-sheaths* striate, ending in a narrow callus and somewhat produced at the mouth, which is furnished with a few, usually 3, long stiff bristles; *ligule* rather long, triangular, pubescent. *Inflorescence*, etc., not known.

Hills of S. Burma; gathered on Moolyet Hill, Tenasserim, at 6,000 ft. by G. Gallatly in 1876 (No. 276).

Plate No. 21.—*Arundinaria Gallatlyi*, Gamble. 1, leaf-branch—*of natural size*; 2, leaf-sheath; 3, transverse venation of leaf—*enlarged* (from Gallatly's specimens).

22. Arundinaria jaunsarensis, *n. sp. Gamble.*

A graceful reed-like small bamboo, with single culms arising at intervals from a long creeping rhizome, the intervals 2 to 3 feet long; scales of rhizome straw-coloured, shining, ovate-acute, imbricate, about 0·5 in. apart; rhizome 0·3 in. diameter, jointed, joints ·5 to ·6 in. long. *Culms* bright green, glaucous when young, greenish-brown when old, smooth, 10 to 15 ft. high, 0·5 in. in diameter; nodes marked by a narrow ring; internodes 9 to 11 in. long; branchlets from the nodes semi-verticillate, rather few. *Culm-sheaths* 6 to 10 in. long by 1·5 to 2 in. broad at base, shorter than the internodes,

straw-coloured, papery, striate, transversely veined, ciliate on the edges, somewhat rounded and gradually narrowed to a truncate apex of ·2 to ·3 in., which has on either side a narrow falcate auricle with a few long stiff hairy bristles; *imperfect blade* narrow, subulate, recurved, 1 to 3 in. long by ·2 in. broad; *ligule* short, truncate, pubescent. *Leaves* thin, lanceolate acuminate, 4 to 6 in. long by ·6 to ·7 in. broad, unequally cuneate at the base into a short petiole, smooth above, slightly rough beneath, scabrous-serrate on the edges; main veins hardly prominent, secondary veins 4 to 5 pairs, intermediate 7 to 8, transverse veinlets numerous, prominent, straight, oblique (about 100 per in.), with often pellucid dots between them; *leaf-sheaths* smooth, striate, keeled, ending in falcate auricles with few (usually 5-6) stiff bristles; *ligule* short, truncate, pubescent. *Inflorescence*, etc., unknown.

Hills of Jaunsar in North-West Himalaya, near Mundali, at 7,000 to 8,000 ft., 1892.

This handsome species is at once distinguished by its single culms arising from a long creeping jointed rhizome, often 3 feet long between the stolons; by its auricled sheath, green culms and leaves thinner than those of its nearest neighbour *A. spathiflora*. It is used for basket-work, and is apparently confined to the one locality.

PLATE No. 22.—*Arundinaria jaunsarensis*, Gamble. 1, leaf-branch; 2, culm with sheaths; 3, culm-sheath—*natural size*; 4, rhizome—*much reduced*; 5, transverse venation of leaf; 6, leaf-sheaths—*enlarged* (from fresh specimens).

23. ARUNDINARIA ROLLOANA, *n. sp. Gamble.*

A shrubby bamboo with stoloniferous distant culms, the rhizomes at first covered with shining, acute, imbricating scales, afterwards jointed, the joints about ·5 in. long. *Culms* about 8 ft. high, ·4 in. in diameter, slightly rough, green at first, afterwards yellow, somewhat flattened on one side; nodes somewhat swollen, lower ones rooting; internodes 8 to 12 in. long, walls rather thin, less than ·1 in. *Culm-sheaths* 4 to 6 in. long, 1 to 2 in. broad, at first covered with scattered appressed bristles, afterwards glabrous, shining, ciliate on the edges, narrowed convexly in the upper third into a rather broad truncate mouth, which is furnished with long, recurved, rounded, falcate auricles with long bristles; *imperfect blade* 1·5 to 2 in. long, narrow, subulate, recurved; *ligule* narrow. *Leaves* 6 to 8 in. long by 1 to 1·5 in. broad, oblong-lanceolate; rounded at the base into a short, very broad, flat petiole; ending above in a rather short acute point; smooth above, sparsely hairy beneath; the edges cartilaginous, spinulose-scabrous; main veins hardly seen above, shining beneath, secondary veins 8 to 10 pairs, intermediate about 7, transverse veinlets very prominent beneath, numerous, straight and regular; *leaf-sheaths* striate, sparsely strigose, hairy, ending in a narrow line and a rounded, long-ciliate auricle; *ligule* long, membranous, deeply cleft. *Inflorescence*, etc., not known.

Naga Hills: found by James Rollo in the Zullah Valley at 5,000 to 7,000 ft. in 1889, and by Sri Gopal Banerjee the same year, and sent by G. Mann.

This is a remarkable species on account of the breadth of its leaves. In its rhizome and distant culms and in the character of the culm-sheaths it resembles *A. jaunsarensis*. It is known by the Naga name of *Jipvö*.

PLATE No. 23.—*Arundinaria Rolloana*, Gamble. 1, leaf-branch; 2, rhizome and culm—*of natural size*; 3, culm-sheath—*reduced*; 4, leaf-sheath—*much enlarged* (all from J. Rollo's specimens).

24. ARUNDINARIA SUBERECTA, *Munro in Trans. Linn. Soc.* xxvi. 32.

A graceful, wiry, erect shrub, growing in thick clumps. *Culms* 10 to 15 ft. high. ·3 in. in diameter, olive green, smooth; nodes slightly swollen; internodes 6 to 10 in. long, cavity very small; branchlets in whorls from the nodes. *Culm-sheaths* 2 to 6 in. long, ·5 in. broad at base, thin, papery, striate, glabrous, gradually attenuate upwards to a naked or fimbriate mouth; *imperfect blade* subulate, leafy, ·5 to 1·5 in. long, recurved; *ligule* long, fimbriate at tip. *Leaves* narrow, linear, 2 to 4 in. long, ·2 to ·3 in. broad; narrowed at the base into an extremely short petiole; tip setaceous, edges revolute; smooth above except the scabrous marginal veins, pale beneath; edges scabrous serrate; main vein narrow, not conspicuous, secondary veins 3 to 4 pairs, intermediate 4 to 5, transverse veinlets none or very scarce, pellucid glands many; *leaf-sheaths* striate, loose, glabrous or slightly hairy when young, ending in a callus and somewhat produced, with a few very deciduous bristles; *ligule* rather long, pubescent. *Infloresence*, etc., not known.

North-East Himalaya and Khasia Hills: collected in 1850 at the Moosmai falls, Khasia Hills, 4,000 ft., by Hooker (No. 558); and at Kalapani, 4,500 ft., by Griffith (No. 1407). I also identify as this C. B. Clarke's No. 19120 from Shillong (which I have figured in default of a specimen of the type); G. Mann's specimen No. 8 from the Khasia Hills, 5,000 ft., 1885, named, *U-kadai-namlang*, and from the Mahtedu river, Jaintia Hills, 4,500, named *Lombnang, namlang*, gathered in 1889; and those sent by Mr. W. A. Kennedy in 1891 to the Calcutta Botanic Garden from Sikkim, though this latter has a more hairy leaf-sheath, and more ciliate leaf auricles.

Used in building native huts. It would probably make excellent fishing rods.

PLATE No. 24.—*Arundinaria suberecta*, Munro. 1, leaf-branch; 2, culm; 3 & 4, culm-sheaths—*of natural size*; 5, leaf-sheath; 6, transverse venation of leaf—*enlarged*. (Nos. 1, 5, 6 from C. B. Clarke's specimens; Nos. 2, 3, 4 from G. Mann's.)

25. ARUNDINARIA KURZII, *n. sp. Gamble.*

Apparently a bushy shrub. *Culms* ·3 to ·4 in. in diameter, smooth; nodes marked with a thick ring and bearing very numerous, long, wiry, filiform, geniculate branchlets. *Leaves* very thin, linear-lanceolate, 2 to 4 in. long, ·2 to ·3 in. broad, tapering unequally at base into a very short petiole; acute above with a short point; smooth on both surfaces except for a few long white bulbous-based hairs on the veins beneath; edges smooth; main vein thin pale, secondary veins 2 pairs, intermediate 5 to 6, transverse veinlets very few and inconspicuous; *leaf-sheaths* slender, striate, ending in a small callus and slightly produced at the edges, and furnished with a few thin ciliæ; *ligule* short, sometimes ciliate. *Inflorescence*, &c., not known.

Coasts of Southern Burma: collected by Kurz on his last tour in 1878.

It is not quite certain in what exact locality this was gathered, but the plant is quite unlike any other species of the eastern region, though it comes near to *A. falcata* of the Western Himalayas. It is remarkable for its very thin leaves and geniculate pale branchlets.

PLATE No. 25.—*Arundinaria Kurzii*, Gamble. 1, leaf branchlets with part of culm.

26. ARUNDINARIA MANNII, *n. sp. Gamble.*

A slender, graceful, tufted, climbing, wiry bamboo. *Culms* solid, having no cavity, ·5 in. thick, 30 ft. high, much branched; nodes thickened, bearing many geniculate branchlets; internodes 3 ft. long, smooth. *Culm-sheaths* 12 to 18 in. long, convolute, apparently persistent, very thin and slender, ·2 to ·3 in. broad at the top, rough with sparse, stiff, brown, appressed bristles; *imperfect blade* inserted on the sheath with the same diameter and continuous with it, very long, linear, often 9 to 10 in. in length, point long, setaceous, closely appressed hairy within at the base; *ligule* narrow, dentate. *Leaves* 6 to 9 in. long, ·7 to nearly 1 in. broad, thin, papery, lanceolate; rounded or attenuate at the base into a short, ·1 to ·2 in. long, wrinkled petiole; the point at first thickened and scabrous hirsute, then surmounted by a long, setaceous, hair-like apex; smooth above except the scabrous points on marginal veins, somewhat glaucous and sparsely rough hairy beneath; scabrous on one edge; midrib vein narrow, shining, secondary veins about 5 pairs, intermediate 5 to 6 hardly recognizable from the secondary, no transverse veinlets; *leaf-sheaths* glabrous, striate, ending on one side in a round shining callus without auricle, on the other in a short pointed auricle with a few long stiff bristles; *ligule* small, hairy, ciliate. *Inflorescence*, &c., unknown.

Jaintia Hills in Assam at about 3,000 ft.

A very curious species, which has been placed in this genus on account of its resemblance generally to *A. Prainii*, especially in the solid culms. The very long narrow sheaths are remarkable, and in its leaves it resembles *Cephalostachyum.* It was found at Amkasur, about five miles from Jarain, in April 1889, by G. Mann, and it is called *Beneng* (Khasia). Mann states that it is much used, split, as a binding material in building huts.

PLATE No. 26.—*Arundinaria Mannii,* Gamble. No. 1, leaf-branch; 2, culm-sheath—*of natural size;* 3, leaf-sheath, both sides—*enlarged.*

2. Phyllostachys, *Sieb. and Zucc.*

Shrubby cæspitose bamboos. *Culms* smooth, flattened on one side; nodes prominent; internodes rather short; branches fasciculate at the nodes. *Culm-sheaths* papery, striate, rounded above; *imperfect blade* narrow, subulate. *Leaves* petiolate, articulate on the sheath, small or moderate-sized, transverse veinlets very numerous, tessellate; *leaf-sheaths* loose, smooth. *Inflorescence* consisting of spicate branchlets arranged in a leafy terminal panicle; the spikelets supported by prominent imbricating bracts which are sheath-like and bear sometimes a leafy imperfect blade. *Spikelets* 2 to 3, alternate, with 1 to 4 fertile flowers and a terminal imperfect one; rachilla articulate between the flowers and produced beyond into a terminal imperfect flower; *empty glumes* 2 to 3, many-nerved, usually unequal, glabrous, often ending in a leafy imperfect blade; *flowering glume* ovate-lanceolate, many-nerved, acuminate; *palea* scarcely shorter than flowering glume, narrow, 2-keeled, many-nerved, often bimucronate. *Lodicules* 3, usually unequal, lanceolate, acute, veined. *Stamens* 3, long-exserted, filaments filiform; *anthers* linear. *Ovary* stalked, rounded, glabrous; *style* long, dividing above into 3 long feathery *stigmas.* *Caryopsis* not known.

Distrib.—Eastern Asia, in China and Japan, extending westwards to the Himalaya and hills of Assam, and containing five or more species. The most important of these,

not here described, is probably *P. nigra*, Munro, which is indigenous in China and Japan and is cultivated in Europe and in the Indian hills.

Leaves thin, leaf-sheaths long bristly ciliate at mouth . . . 1. *P. bambusoides*.
Leaves thick, leaf-sheaths with hardly any bristles at mouth . . 2. *P. Mannii*.

1. PHYLLOSTACHYS BAMBUSOIDES, *Sieb. and Zucc., Abh. Akad. der Phys. Wissensch. München* iii. 745, *tab.* 5, *fig.* 3 (1843).

A cæspitose shrub. *Culms* graceful, yellow, smooth, 10 to 12 ft. high, about ·5 to ·7 in. in diameter or less, flattened on one side in alternate internodes; nodes prominent, glabrous; internodes short; branches semi-verticillate from the nodes. *Culm-sheaths* 6 to 10 in. long, 1 to 2 in. broad, thin, papery, striate, rounded above into a short neck and truncate, the margins produced to meet the ligule and furnished with a few long stiff ciliæ; *imperfect blade* narrow, subulate, recurved; *ligule* long, blunt, dentate. *Leaves* thin, oblong-lanceolate, 3 to 4 in. long usually, ·5 to ·7 in. broad, rounded at the base into a ·1 to ·2 in. long, black, hairy petiole, ending above in a setaceous point; smooth above, glaucous beneath, and with white stiff hairs below; scabrous-serrate on one margin; main vein prominent; secondary veins 5 to 6 pairs, intermediate about 7, transverse veinlets very numerous, finely tessellate; *leaf-sheaths* loose, keeled, striate, glabrous, ciliate on one edge; usually furnished at the mouth with several long stiff bristles on a short auricle; *ligule* rather prominent, rounded. *Inflorescence* a large leafy panicle of bracteate spikes of spikelets; the bracts short, obtuse, sheathing, paleaceous with a leafy imperfect blade; spikelets in each bract 3 to 5 fertile. *Spikelets* 1 to 1·2 in. long, ·1 to ·2 in. broad; *empty glumes* 2, lower very large, sheath-like, bluntly truncate, with a foliaceous green cordate blade, which becomes smaller or disappears in the upper flowers, upper short, ·3 in. long, oblique, keeled, ciliate on the keels, few-nerved, those of upper flowers longer and more unequal sided, in terminal spikelets sometimes wanting; *flowering glumes* ovate, acuminate, ·8 in. long by ·3 in. broad; main nerve strong, secondary 5 to 6 pairs; *palea* about as long, narrow, 2-keeled, minutely scabrous, ciliate on the keels, bimucronate. *Lodicules* ovate-lanceolate or ob-lanceolate, sometimes emarginate or bifid, shortly ciliate, 3—7-veined, unequal. *Stamens* very long, exserted, drooping; *anthers* ·4 in. long with the connective apiculate. *Ovary* depressed, ovoid, glabrous, stalked at the base, surmounted by a very long 1 in. to 1·2 in. *style*, finally divided into 3 long, minutely feathery stigmas. *Caryopsis* not known. *Steudel Syn.* 339; *Munro in Trans. Linn. Soc.* xxvi. 36; *Franch. et Sav. Enum. Pl. in Jap. cresc.* 182. PHYLLOSTACHYS MEGASTACHYA, *Steudel Syn.* 339; *Walp. Ann.* i. 946. BAMBUSA RETICULATA, *Rupr. Bamb.* 58. BAMBUSA BIFOLIA, *Sieb. MS.* (teste Munro).

North-East Himalaya, Mishmi Hills: collected by Griffith at Premsong's village—see Journ., p. 38.—Distrib.—China and Japan, cultivated in Europe and elsewhere, *e.g.* in Simla.

Munro has identified Griffith's plant with the well-known China and Japan species, but apparently no flowers have been seen. I have consequently taken my plate from a Hongkong specimen in the Calcutta Herbarium. But G. Mann has sent leaf-specimens of two species of PHYLLOSTACHYS, one of which seems to agree with this, but cannot be certainly identified without flowers, and the other appears to be new (*see* below). Griffith described his plant as 'a small hard bamboo which forms excellent walking sticks.' Mann's specimens were collected from cultivated plants found in the Sibsagar

district, and said to be wild in the Naga Hills. The roots are stoloniferous, and the native names are *Deo*, *bih* (Assamese).

PLATE No. 27.—*Phyllostachys bambusoides*, Sieb. and Zucc. 1, leaf and flower branch—*of natural size;* 2, outer empty glume; 3, flowering glume; 4, palea; 5, lodicules; 6, anther; 7, ovary, style and stigmas; 8, transverse venation of leaf—*enlarged.* (All from a Hongkong specimen collected by C. Ford, now in the Calcutta Herbarium.)

2. PHYLLOSTACHYS MANNII, *n. sp. Gamble.*

A cæspitose shrub. *Culms* 15 to 20 ft. high, 1 to 1·2 in. in diameter; internodes 8 in. long, yellow, flattened on one side. *Culm-sheaths* papery, straw-coloured, 8 to 9 in. long, 1 to 2 in. broad, rounded at the top and truncate; *imperfect blade* 2 to 3 in. long, recurved, narrow, subulate, decurrent on the sheath; *ligule* broad, long-pectinate. *Leaves* thick, 4 to 5 in. long, ·5 to ·8 in. broad; rounded at base into a rather long ·3 in. petiole; shortly acuminate at tip; smooth and glabrous on both surfaces except a few white hairs near the midrib below; spinulose-serrate on one edge; main vein prominent below, shining, secondary veins 5 pairs, intermediate 7 to 8, transverse veinlets extremely numerous and very finely tessellate; *leaf-sheaths* loose, glabrous, smooth, straw-coloured, ending in a narrow ciliate callus with a few deciduous bristles; *ligule* short. *Inflorescence*, etc., unknown.

Cultivated at Shillong, Khasia Hills, 5,000 ft., and said to have come from the Naga Hills: collected by G. Mann in 1889, and called *Deo.*

This is a pretty species which I cannot identify with any other I have seen, and which I consequently describe as new, but with some diffidence. I have received specimens from J. W. Oliver, collected from plants cultivated at Bernardmyo and called by the Shans '*Mai-pang-pük*' which I think belong also to this species. The culms are used for walking sticks.

PLATE No. 28.—*Phyllostachys Mannii*, Gamble. 1, leaf-branch; 2, culm-sheath—*both of natural size.*

Sub-tribe 2.—EUBAMBUSEÆ.

Filaments free.
- Paleæ not at all or slightly cleft, all keeled . . . . 3. *Bambusa.*
- Paleæ deeply cleft, uppermost not keeled . . . . . 4. *Thyrsostachys.*

Filaments connate in a thin tube.
- Spikelets many-flowered; all the paleæ 2-keeled . . . 5. *Gigantochloa.*
- Spikelets few-flowered; paleæ of upper flower none or, like the glumes, not keeled . . . . 6. *Oxytenanthera.*

3. Bambusa, *Schreber.*

Arborescent, or shrubby, or rarely climbing bamboos, sometimes thorny, sometimes of large size; a few species gregarious. *Culms* from a thick rhizome, usually cæspitose, occasionally stoloniferous from long underground shoots. *Culm-sheaths* various, the sheath usually broad and the imperfect blade broad, triangular in shape. *Leaves* small to moderate-sized, rarely large, linear or oblong-lanceolate, acuminate, shortly petiolate; *leaf-sheaths* variously auricled. *Inflorescence* more usually a large leafless compound panicle bearing spikelets in heads in spicate branchlets; sometimes in leafy panicles or paniculate spikes, and occasionally short. *Spikelets* with 1 or many fertile flowers usually supported by

1 to 3 empty glumes; *flowering glume* ovate-lanceolate, usually mucronate; *palea* two-keeled, the keels ciliate or not, the point usually entire. *Lodicules* 3, membranous, generally obtuse, ciliate. *Stamens* 6, filaments free, often exserted; *anthers* narrow, tip obtuse or apiculate or penicillate. *Ovary* oblong or obovate, hairy at the apex; *style* short or elongated; *stigmas* 1 to 3, plumose or hairy. *Caryopsis* oblong or linear-oblong, acute or obtuse, furrowed on one side; pericarp thin, adherent; embryo conspicuous.

DISTRIB.—Besides the 24 Indian and Straits species herein described, there are about 6 Chinese (*B. tuldoides*, Munro; *B. angulata*, Munro; *B. breviflora*, Munro; *B. flexuosa*, Munro; *B. Beecheyana*, Munro, and *B. Oldhami*, Munro) and 1 Malay species (*B. cornuta*, Munro) which are well known; and there are also about 7 species from Eastern Asia and 12 from the Malay Islands which are only very imperfectly known and described. Of the 24 here described, 8 belong to the Western Peninsula, 9 to the Burmese region, and 5 to Malaya and the Islands of the Bay of Bengal, while 2 (*B. vulgaris* and *B. nana*) are cultivated species frequently met with throughout the Indo-Malayan area, and one of them (*B. vulgaris*) also in America. Only one is certainly known from Australia, viz.: *B. aruhemica*, von Muell. from the North-East.

Analysis of the species.

Culms without spines to the branches.
Fertile flowers several.
Spikelets cylindric. SECTION I.
Spikelets in loose heads.
Arborescent.
Culm-sheaths, where known, with imperfect blade triangular from a broad base.
Culm-sheaths with large auricles.
Paleæ ciliate on the keels.
Spikelets long.
Spikelets many.
Anthers obtuse . . . . 1. *B. Tulda.*
„ apiculate . . . . . . 2. *B. nutans.*
„ penicillate . . . . . . 3. *B. teres.*
Spikelets few . . . . 4. *B. Ridleyi.*
Spikelets short . . . . 5. *B. burmanica.*
Paleæ not ciliate on the keels . . . . 6. *B. polymorpha.*
Culm-sheaths with small auricles . . . . 7. *B. pallida.*
Culm-sheaths with narrow imperfect blade and without auricles . . . . 8. *B. affinis.*
Culm-sheaths with inflated imperfect blade, leaf-tip shaggy . . . . 9. *B. khasiana.*
Shrubby . . . . 10. *B. nana.*
Spikelets in dense heads, ovate . . . . 11. *B. Balcooa.*
Spikelets flattened. SECTION II.
Spikelets apparently 2-cleft, few-flowered . . . . 12. *B. vulgaris.*
Spikelets with distichous flowers.
Fertile flowers 5 to 6.
Anthers blunt or with 1 hair only at tip . . . . . 13. *B. Binghami.*
Anthers acute with 3 or more hairs at tip . . . . . 14. *B. Kingiana.*
Fertile flowers many, about 10, no lodicules. SECTION III. 15. *B. lineata.*

Fertile flowers few.
Fertile flowers 2 to 3. Section IV. . . . . 16. *B. schizostachyoides*
Fertile flowers 1 only. Section V.
Heads small distant, leaf auricles long ciliate . . . . 17. *B. Griffithiana.*
Heads large, leaf auricles not long ciliate . . . . 18. *B. Wrayi.*
Culms thorny. Section VI.
Culm-sheaths short, long-auricled; spikelets usually elongate, rachillæ evident . . . . 19. *B. Blumeana.*
Culm-sheaths long, not auricled; spikelets short, acute; rachillæ not evident . . . . 20. *B. arundinacea.*

Species of which the flowers are not known.

Culms yellow, erect; leaves glabrous, sheaths with naked auricles . . . . . 21. *B. auriculata.*
Culms erect; leaves narrow, hairy near the base below and on leaf sheath . 22. *B. villosula.*
Culms scandent; leaves glabrous, leaf sheaths with long bristles . . . . . 23. *B. Mastersii.*
Culms scandent; leaves with shaggy margins near the tip . . . . 24. *B. marginata.*

SECTION I.

1. Bambusa Tulda, *Roxb. Hort. Beng.* 25 (1814).

An evergreen or deciduous, cæspitose, arboreous, gregarious bamboo. *Culms* green or glabrous when young, grey-green when older, sometimes streaked with yellow, 20 to 70 feet high, not or little branched below, 2 to 4 in. in diameter; nodes not swollen, the lower ones fibrous-rooted; internodes 1 to 2 feet long, white-scurfy when very young, ringed with white below the nodes, the walls thin, ·3 to ·5 in.; branches many from nearly all nodes, those of lowest ones thin, nearly leafless, horizontal. *Culm-sheaths* about 6 to 9 in. long, 6 to 10 in. broad, smooth or whitish-powdered or covered with appressed brown hairs without, often white-powdered within; slightly attenuate upwards and rounded or triangularly truncate at top; *imperfect blade* broadly triangular, reniform or cordate, cuspidate, erect, hairy within, the base decurrent into rounded, large, long-fringed auricles, or a wavy narrow-fringed band along the upper edge of the sheath; *ligule* narrow, entire. *Leaves* linear-oblong or linear-lanceolate, 6 to 10 in. long by ·7 to 1·5 in. broad; usually rounded at the base into a short ·1 in., often hairy petiole; acuminate above in a subulate twisted point; glabrous above, except for the scabrous veins near the margin on one side, glaucescent and puberulous beneath; scabrous on the edges; main vein rather narrow, secondary veins 6 to 10, intermediate 7 to 8, pellucid glands faint, scanty; *leaf-sheath* striate, glabrous, ending in a smooth callus and an oblong rounded auricle, fringed with long, thin, whitish bristles; *ligule* narrow, inconspicuous. *Inflorescence* variable, sometimes an immense radical leafless panicle, sometimes a short leafy paniculate or spicate branch; branches spicate, bearing interrupted clusters of few (1 to 5) usually fertile long spikelets, supported by shining chaffy bracts; rachis smooth, striate. *Spikelets* variable in length, 1 to 3 in. long, ·2 in. broad, sessile, glabrous, cylindrical and acute at first, afterwards divided into many flowers separated by conspicuous rachillæ, bearing first 1 to 2 short bracts, then 2 to 4 usually gemmiparous empty glumes, then 4 to 6 fertile flowers, and finally 1 or 2 imperfect or male terminal flowers; *empty glumes* acute, many-nerved; *flowering glume* many-nerved, glabrous, striate, ·5 to 1 in. long, ·3 in. broad, ovate acute or acuminate, mucronate, sometimes minutely ciliate on the edges; *palea* rather shorter, boat-shaped,

2-keeled, with long white ciliæ on the keels and penicillate at the tip, 5 to 7 nerves in the hollow between the keels; *rachillæ* clavate, flattened, striate, glabrous except on the ciliate tip and occasionally the faintly ciliate edges, articulate below the glumes, so that the spikelet readily breaks up. *Lodicules* 3, ·15 in. long, two cuneate, oblong, obliquely truncate thickened and fleshy below, especially on one side, hyaline and about 5-nerved above, the upper part long-white fimbriate; the third not thickened, hyaline, acute, long-fimbriate. *Stamens* long exserted, *anthers* ·3 to ·4 in., purple, glabrous, blunt at the tip or emarginate. *Ovary* obovate-oblong, white, hairy above, surmounted by a short hairy style which is early divided into 3 long plumose wavy stigmas. *Caryopsis* oblong, hirsate at the apex, furrowed, ·3 in. long. **Roxb. Fl. Ind.** ii. 193, **Icon. ined.** t. 1403; **Munro in Trans. Linn. Soc.** xxvi. 91; **Brandis For. Flora** 566; **Kurz For. Fl. Burma** ii. 552. B. MACALA, *Buch.-Ham.* Wall. Cat. 5026A; BAMBUSA, Wall. Cat. 5027, 5030B, 5030C. DENDROCALAMUS TULDA, *Voigt Hort. Sub. Calc.* 718.

Central and Eastern Bengal, Assam and Burma, also in the hills of the Northern Circars (if I am right in considering the common gregarious bamboo of the hills of the Golgonda Agency in the Vizagapatam district to be this species) and probably in those of Orissa. It is cultivated all through Eastern Bengal and Burma, and is probably the most common kind in the Lower Bengal rice country and in the Assam valleys.

It is by no means easy to distinguish this bamboo in the Herbarium from some of its neighbours when the flowers are not present; even when growing it is not always easy to recognize it from *B. nutans*. It varies, however, a good deal, both in the size of flower and size and shape of leaf and culm sheath, and this probably accounts for its many native names. I have a large series of specimens from Assam through G. Mann which bear the names *Mirtenga* (Sylhet), *Wati* (Garo), *Wamuna, wagi, nal-bans* (Assamese), *Deo-bans* (Assam-Burmese), *Bijuli, jati, jao, ghora* (Kamrúp). Roxburgh gives the names *Tulla, jowa* (Bengali); *Peka* (Hindi). I have specimens of my own collecting from Jalpaiguri and Buxa in the Western Duars called *Kiranti* and *Matela*, and these also I identify as *B. Tulda*. C. B. Clarke has kindly given me specimens collected by himself at Jessore, Barisal and Rangpur. In Chittagong it is called *Mitenga, Mritenga*, and specimens were collected by J. L. Lister in 1876, and by R. Ellis in 1886. The Burma specimens collected by Brandis, by Kurz in Martaban and Pegu Yomas (No. 154), as well as those lately sent me from the Meza Forests in Upper Burma by J. W. Oliver, Conservator of the Eastern Circle, are named *Thaikwa* (Burmese), and differ from the Bengal and Assam specimens by having smaller flowers, the spikelets rarely longer than 1·5 in. and the flowering glumes ·4 in., but I see no reason to separate them. As enumerated by Munro, it had been previously collected by Roxburgh, Wallich, Griffith, Hamilton, Masters and others, and the Calcutta Herbarium has specimens from many collectors. As regards its years of flowering, it undoubtedly has the habit of flowering gregariously over considerable areas, but single clumps, as has been observed in the Royal Botanic Garden of Calcutta, if badly treated by over-cutting or partly uprooted, will often produce flowers without any general flowering. Kurz collected flowers in 1867-68, Clarke in 1872 and again in 1884, all in Bengal; Mann's collectors sent it from Assam in 1889, and J. W. Oliver from Burma in 1892. In Chittagong it was gathered in flower in 1876 and 1886. The culms are used for all general purposes, and they are strong, but cannot approach those of *B. Balcooa*, as Roxburgh pointed out. Roxburgh says that if seasoned in water they become more durable, otherwise they

are soon devoured by a small *Bostrichus* beetle. They are used for building, scaffolding, the making of mats and baskets, and when very young, they are, according to Roxburgh, pickled and eaten.

PLATE No. 29.—*Bambusa Tulda*, Roxb. 1, leaf-branch; 2 & 3, parts of flowering panicle—*of natural size;* 4 & 5, culm-sheaths—*reduced considerably;* 6, leaf-sheath; 7, spikelet when young; 8, do. when older; 9, flowering glume; 10, palea; 11, lodicules; 12, anthers; 13, ovary, style and stigmas; 14, caryopsis—*all enlarged.* (No. 5 from Kurz' drawing, No. 14 from Wallich's 5027; rest from fresh specimens collected in the Royal Botanic Garden, Calcutta.)

2. BAMBUSA NUTANS, *Wall. MS. in Herb.* 5031.

A moderate-sized graceful bamboo, with culms arising singly from a creeping rhizome much branched above, naked below. *Culms* green, smooth, not shining, white-ringed below the nodes, 20 to 40 ft. high, 1·5 to 3 in. in diameter, straight; nodes not much raised, often hairy, lower ones bearing rootlets; internodes 15 to 18 in. long, thick-walled. *Culm-sheaths* rather variable, 6 to 9 in. long, covered on the back with appressed scattered black hairs, the base bearing a ring of soft deciduous hairs; roundedly truncate at top; *imperfect blade* of lower nodes and uppermost shoots 6 to 9 in. long and very broad, that of middle nodes shorter, acute, margins recurved, clothed within with appressed black hairs, rounded at the base and again decurrent on the top of the sheath, and bearing large waved auricles, one usually erect, the other decurrent, both densely furnished with long curved bristles; *ligule* ·1 to ·2 in. smooth, dentate. *Leaves* linear-lanceolate, 6 to 12 in. long, 1 to 1·5 in. broad; rounded or attenuate at the base into a ·1 to ·2 in. petiole; ending above in a twisted scabrous point; green on both sides when fresh, when dried white beneath, glabrous above except the scabrid hairs on the midrib and marginal veins, glabrous or slightly hairy beneath; scabrous on the edges; main vein rather narrow, prominent, pale beneath, secondary veins 7 to 10, intermediate 8 to 9, pellucid glands frequent; *leaf-sheaths* striate, hairy when young, ending in a smooth callus and produced in a falcate auricle with a few long bristles; *ligule* elongated, obtuse, hairy. *Inflorescence* a stiff panicle bearing spicate branches with clusters of stiff erect spikelets in bracteate heads, rachis smooth. *Spikelets* many, sterile, or bearing gemmiparous glumes, few fertile, ·7 to 1 in. long, glabrous, acute; *empty glumes* 2 to 3, glabrous, mucronate, gemmiparous; fertile flowers 3 to 5; *flowering glumes* ovate, acute, mucronate, many-nerved, minutely hairy within; *palea* flattened, shorter than flowering glume, ovate, 2-keeled, with the long white ciliæ on the edges of the keels overlapping; *rachillæ* clavate, hairy and ciliate at the top, uppermost 2 to 3 flowers usually imperfect. *Lodicules* 3, broad, obtuse, long fimbriate, fleshy at first, many-nerved, one narrower than the other two. *Stamens* sometimes 7, *anthers* long apiculate or slightly penicillate at apex. *Ovary* sub-obovate, stalked, glabrous below, pubescent above; *style* short pubescent, *stigmas* 2 to 3, shortly plumose, twisted, nearly glabrous. *Caryopsis* oblong, obtuse, hairy on the top. *Munro in Trans. Linn. Soc.* xxvi. 92; *Brandis For. Flora* 567. BAMBUSA FALCONERI, *Munro in Trans. Linn. Soc.* xxvi. 95 (in part). BAMBUSA, Wall. Cat. 5030A.

Lower Himalaya from the Jumna to Assam, Eastern Bengal. It is doubtful if this is really wild west of the Sarda, but it is very common in villages and along roads and canals in Dehra Dún. In the Sikkim Hills it is found up to 5,000 ft.

This species is extremely difficult of separation from *B. Tulda*, Roxb., when flowers are not available: the leaves and culm-sheaths agree very nearly, and it is only in flower or growing that the two can be distinguished. The best distinction is that of the culms, which in *B. nutans* come singly from a creeping rootstock, while in *B. Tulda* they are from a central tuft, but even this is not a constant character. The spikelets are much stiffer and shorter and the bristles of the leaf-sheaths are usually spreading, while those of *B. Tulda* are generally erect and regular. It is known, according to Munro, as *Peechle* in Sylhet and as *Bidhuli, mukial* in Assam; as *Mahlo* in Sikkim. I have collected, and Mr. G. A. Gammie has sent, specimens from Sikkim under the names *Malloo*, *mahl-bans* (Lepcha), and Mr. Gammie has also sent a variety with striped culms under the Lepcha name *Pao-shi-ding-ying* which I take to belong to this species. I also identify as this the following specimens sent by G. Mann from Assam:—*Jotia makal* (Assamese) from Sibsagar, *Deobans* (Assamese) from Kamrup, *Wa-malang* (Kuki) from North Cachar, *Seringjai* (Khasi) from Shillong; but I am by no means sure of the identification, as any of them might be *B. Tulda* instead, though they seem to me to be more like *B. nutans*. After searching, during three years' residence in Dehra Dún, for *Bambusa Falconeri*, Munro, Trans. Linn. Soc. xxvi. 95, I have come to the conclusion that the hint given by Munro as to the flowers and by Brandis in *For. Flora* 568, as to the leaves, is probably the true state of the case, and that Munro's *B. Falconeri* simply consists of the flowers of *B. nutans* gathered by Falconer in September 1840 with the leaves of *Dendrocalamus Hamiltonii* gathered by Falconer in 1839 and by Strachey and Winterbottom in Garhwal. *Dendrocalamus Hamiltonii* is undoubtedly the large bamboo of the Dún and of the villages of the Lower Garhwal Hills, for I have often found it in flower, and *B. nutans* is commonly grown with it in the Dún, so that the mistake is by no means improbable, and my view is certainly borne out by an examination of the specimens in Herbaria. I propose, therefore, to omit *B. Falconeri* from consideration in this work.

The culms of *B. nutans* are strong, straight and good, and much esteemed. In the Dehra Dún the villagers cultivate it by planting offsets, and the cut culms fetch good prices. It is a graceful species worth growing for ornament, and its culms being well apart, makes it easy to work for profit. It seems to flower only at long intervals, for in the Dún at any rate there is no record since 1840, but last year (1893) I found one mutilated clump bearing flowering branches at the base, and this year (1894) I have found one whole clump in flower, so it may be about to flower generally.

PLATE No. 30.—*Bambusa nutans*, Wall. 1, leaf-branch; 2 & 3, parts of flower panicle—*of natural size;* 4 & 5, culm-sheaths from mid-stem and lower nodes—*reduced to about* $\frac{1}{4}$; 6, leaf-sheath; 7, spikelet cluster with sterile and fertile spikelets; 8, flowering glume; 9, palea; 10, lodicule; 11, anther; 12, ovary, style and stigmas; 13, rachilla—*enlarged.* (Nos. 4, 5, 6, from fresh Dehra Dún specimens, the rest from Falconer's specimens.)

3. BAMBUSA TERES, *Ham.* 881; in *Wall. Cat.* 5026*B*.

A large, thickly cæspitose bamboo. *Culms* dark green, 60 ft. high, 3 in. in diameter, smooth; nodes formed by a ring consisting of the bases of fallen sheaths; internodes 20 in. long, wall ·3 to ·4 in. thick. *Culm-sheaths* 8 to 10 in. long, as much in breadth, nearly glabrous, hardly attenuate upwards, somewhat rounded at top;

imperfect blade 4 to 6 in. long, broad, triangular, cuspidate, appressed-hairy beneath, rounded at the base, and then again decurrent in broad wavy auricles fringed with few deciduous bristles; *ligule* narrow, ·1 in. broad, white-hairy outside. *Leaves* oblong-lanceolate, 12 to 14 in. long, 1·5 to 1·8 in. broad, unequal at the base, and narrowly attenuate into a short ·1 in. petiole; above long acuminate, with a twisted, scabrous, setaceous point; glabrous above except the scabrous points on marginal veins, shortly pubescent beneath; scabrous on the edges; main vein conspicuous, shining, secondary veins 10 to 16, intermediate 5 to 7, pellucid glands many, giving the appearance of strongly marked tranverse veinlets beneath; *leaf-sheaths* glabrous or slightly hairy, ending in a broad shining callus, straight truncate at the mouth; *ligule* short. *Inflorescence* a large compound panicle with spicate branches bearing heads of sterile and fertile spikelets with chaffy bracts; rachis usually fistular, striate. *Spikelets* up to 2 in. long with 1 to 2 empty or gemmiparous glumes, 5 to 6 fertile flowers, and 1 to 2 terminal imperfect flowers; rachilla obcuneate, striate, minutely ciliate at top; *empty glumes* ovate-acute, mucronate; *flowering glume* ovate-lanceolate with a broad base, acute, glabrous, sometimes with a soft sub-foliaceous point, many-nerved; *palea* ovate, 2-keeled, scabrous, toothed on the keels, 5-6-nerved between them, tip glabrous or penicillate. *Lodicules* almost obovate, long-fimbriate, many-nerved. *Anthers* narrow, penicillate at the apex. *Ovary* ovate, acute, hairy above, with a short *style* and 3 long hairy *stigmas*. *Caryopsis* not known. *Munro in Trans. Linn. Soc.* xxvi. 95.

Eastern Bengal and Assam: collected at Gongachora in 1809 by Hamilton, and in Assam by Jenkins.

Very little is known of this plant except the original sheets in the Kew Herbarium. But I believe I am right in identifying with it No. 1001 collected by G. Mann in 1891 at Charduar in the Durrang district of Assam, though the spikelets are not quite so long, and the rachis not so soft and fistular as in the type. I also think that G. Mann's *Bhaluki-makal* (Assamese) collected in Sibsagar in 1889, is this species. He says it is a soft-culmed kind easily attacked by insects, and consequently not much used for building

PLATE No. 31.—*Bambusa teres,* Ham. 1, leaf-branch; 2, flowering branch—*of natural size;* 3, culm-sheath—*slightly reduced;* 4, leaf-sheath; 5, flowering glume; 6, palea; 7, lodicules; 8, anther; 9, ovary; 10, rachilla—*somewhat enlarged.* (Nos. 3 and 7 from Mann's '*Bhaluki-makal*'; rest from Hamilton's and Jenkins' specimens in the Royal Herbarium, Kew.)

4. BAMBUSA RIDLEYI, *n. sp. Gamble.*

Culms and *culm-sheaths* not known. *Leaves* 12 to 14 in. long, 1·5 to 2 in. broad, oblong-lanceolate; unequally narrowed at the base into a short ·2 in. broad petiole; ending above in a subulate scabrous point with the margins recurved, sometimes contracted below the tip; slightly scabrous above, especially on marginal veins, smooth beneath; edges not scabrous; main vein narrow, shining, secondary veins 10 to 12, not conspicuous, intermediate 3 to 5; *leaf-sheaths* appressed, hairy, somewhat keeled, ending in a narrow callus, and truncate at the edges where they meet the ligule; *ligule* ·2 to ·3 in. long, very deeply cleft in the middle into two elongate rounded lobes, bearing long stiff ciliæ. *Inflorescence* on long spicate leafy branches bearing very distant heads of few spikelets, many sterile; rachis roughish. *Spikelets* 1 to 2 in. long,

glabrous, lanceolate, bearing 2 to 4 empty glumes, then 3 to 5 fertile flowers, then 1 to 2 imperfect ones; *empty glumes* ovate, mucronate, striate; *flowering glumes* ·8 in. long, ovate-lanceolate, glabrous without, sometimes minutely hairy within, mucronate, many-nerved; *palea* shorter than flowering glumes, oblong, acute, bifid at the apex, keels only very minutely ciliate near the tip, many-nerved between; rachillæ glabrous, club-shaped, short. *Lodicules* 3, two ·3 in. long, somewhat one-sided, lanceolate, long fimbriate; the third ovate, acute, shorter; all many-nerved. *Stamens* hardly exserted, *anthers* long, narrow, setose-apiculate. *Ovary* somewhat elongate, hairy above, the style soon dividing into three plumose stigmas. *Caryopsis* not known.

Singapore: collected in 1890 by H. N. Ridley (No. 1693) at Bukit Timah.

The very long smooth spikelet, bifid palea, long lodicules and remarkable ligule characterise this species, which I have placed next to *B. Tulda*, *nutans* and *teres* on account of the character of the spikelets, though the culm-sheaths are not known.

PLATE No. 32.—*Bambusa Ridleyi*, Gamble. 1, leaf and flower branch; 2, part of flower spike—*of natural size;* 3, leaf-sheath; 4, spikelet; 5, flowering glume; 6, palea; 7, lodicules; 8, anther; 9, ovary and stigmas—*enlarged* (from specimen in Singapore Botanical Garden Herbarium).

5. BAMBUSA BURMANICA, *n. sp. Gamble.*

A large handsome bamboo. *Culms* up to 50 or 60 ft. in height and 4 in. in diameter, dull green, strong, nearly solid; nodes not much swollen, marked by a white ring of hairs below them; internodes 12 in. long or more. *Culm-sheaths* of young plants green, turning yellow at the edges, covered with appressed golden hairs on the sides, glabrous on the back, rather broader than long, rounded above; *imperfect blade* short, broad, cuspidate, cordately rounded at base and then again widening out into large rounded fringed auricles; *ligule* short, entire. *Leaves* of young plants 10 to 12 in. long, 1·5 to 2 in. broad, oblong-lanceolate, white-hairy on both surfaces, but less so above; *leaf-sheaths* striate, very pubescent, furnished with a large rounded fringed auricle; when older 8 to 10 in. long by 1 to 1·5 in. broad, linear-lanceolate, smooth above, whitish and pubescent beneath, unequally attenuate or rounded at base into a very short ·1 in. petiole, ending above in a subulate, setaceous, twisted, scabrous point, scabrous on the edges; main vein prominent, secondary veins 7 to 8, intermediate 5 to 8, many pellucid glands; *leaf-sheath* nearly glabrous, reddish-brown, keeled, ciliate on the edges, truncate at top with a small deciduous auricle and deciduous ciliæ; *ligule* short, minutely dentate. *Inflorescence* a panicle of spicate branches, bearing heads of few spikelets in the axils of smooth, 1 in. long, truncate bracts; rachis slender, wiry, pubescent above. *Spikelets* up to 1 in. long, narrow, many-flowered; *empty glumes* 2, striate, minutely hairy within, mucronate; fertile flowers 5 to 6; *flowering glumes* ovate acute, mucronate, many-nerved; *palea* ovate, elliptic, 2-keeled, white ciliate on the keels, 4 to 5 prominent veins between, edges overlapping; terminal 1 or 2 flowers imperfect; rachilla short, thick, glabrous except a ciliate ring at the top. *Lodicules* 3, two bluntly and obliquely truncate, thickened at base, 5- to 6-nerved, the third rhomboidal, narrowed at base, thinner. *Stamens* with narrow anthers ending in an apiculate point. *Ovary* stalked, cylindric, truncate, white-hairy on top; *style* very short; *stigmas* 3, pubescent. *Caryopsis* ·3 in. long, smooth except the hairy top which is crowned by a persistent style, grooved on one side.

Upper Burma, in the Katha district, found on dry hill slopes.

This handsome species flowered in 1890, and seeds were largely collected and distributed by J. W. Oliver, Conservator of Forests, from which many plants were reared at Dehra Dún and elsewhere. He also sent flowering specimens which were rather poor and hardly sufficient for description. The name is *Thaikwa* or *thaikwagyi* (?), and it is just possible that it may prove to be identical with *Bambusa villosula*, Kurz. Oliver describes it as a large species, considerably larger than *B. Tulda* (also known as *Thaikwa*).

Plate No. 33.—*Bambusa burmanica*, Gamble. 1, leaf-branch; 2, part of flower panicle; 3, culm-sheath from young plant—*of natural size;* 4, leaf-sheath of young plant; 5, spikelet (young); 6, flower; 7, flowering glume; 8, palea; 9, lodicules; 10, anther; 11, ovary, style and stigmas; 12, the same, older; 13, caryopsis—*all enlarged.* (Nos. 3 and 4 from specimens cultivated in Dehra Dún; rest from Oliver's Burma collection).

6. Bambusa polymorpha, *Munro in Trans. Linn. Soc.* xxvi. 98.

A large evergreen tufted bamboo, sometimes leaf-shedding in dry seasons. *Culms* in dense clumps, 50 to 80 ft. high, 3 to 6 in. in diameter, grey to greyish-green, white-scurfy when young; nodes thickened, lower ones fibrous-rooted; internodes 15 in. to 2 ft. long; naked below, much branched above and curving outwards. *Culm-sheaths* thick, 6 to 7 in. long, 12 to 14 in. broad, covered on the back with densely and closely appressed white pubescence, sub-attenuate upwards and curvedly truncate at about 5 to 6 in. in breadth; *imperfect blade* reniform, concave, cuspidate, about 3 in. long and much broader, the lower part plaited and long ciliate, then rounded at the base and again widening into a broad band lining the top of the sheath, and produced beyond it in falcate auricles often one upwards, the other down, the whole fringed with long rough bristles; *ligule* narrow, entire. *Leaves* small, linear, thin, 3 to 7 in. long, ·3 to ·5 in. broad; somewhat unequally rounded or attenuate at the base into a very short, hardly ·05 in., petiole; ending above in a short, subulate, scabrous point; at first hairy on both surfaces, especially below, afterwards nearly glabrous; somewhat scabrous above and on the margins and main vein; secondary veins 4 to 6 on either side faint, intermediate 7; *leaf-sheaths* keeled, compressed, striate, hairy, ending in a callus and a minute auricle furnished with a few long deciduous bristles; *ligule* very short. *Inflorescence* a much-branched panicle, with curving spikes of frequent heads bearing few spikelets surrounded by brownish, glabrous, mucronate, chaffy bracts; rachis smooth, the upper part covered with appressed whitish pubescence, ultimate segments very slender, wiry. *Spikelets* shining, often brownish, ·4 to ·5 in. long, in lower heads 5 to 6, number gradually decreasing upwards, somewhat pedicellate and enclosed in a long, curved, glabrous bract; *empty glumes* 1 to 3, ovate-mucronate, then 2 to 3 fertile flowers, then a terminal imperfect flower supported by a long, flattened, glabrous rachilla; *flowering glumes* ovate-mucronate, many-nerved; *palea* somewhat longer, lanceolate, acute at top, keels not ciliate. *Lodicules* 3, sub-orbicular, short-fimbriate all round, 3—5-nerved, one smaller than the others. *Stamens* partly exserted; *anthers* purple, usually blunt, but sometimes apiculate. *Ovary* obovate, hairy at top, style soon dividing into 3 shortly-white-hairy *stigmas.* *Caryopsis* ovate, ·2 in. long, depressed, flattened on one side, rounded on the other, hairy above, ending in a short hairy mucro formed by the base of the style. *Kurz For. Fl. Burma* ii. 553.

Eastern Bengal and Burma. A common species in the upper mixed forests of the Pegu Yomah and Martaban, often associated with teak, extending north-westwards into Sylhet.

This species was originally collected in flower by Brandis in 1862, in Zamayi forests, and afterwards by Kurz at Thaukyegat in 1871. It is also said to have recently flowered in the Bassein forests. It is known locally as *Kyathaungwa* (Burmese), and is considered the best kind for the walls, floor and roofs of houses in Lower Burma. It is cultivated in the Calcutta Botanic Garden (No. 6 in the bamboo grove), and though apparently it is so common a species in Burma, it is strange that it has been so seldom collected. The flowering panicles resemble at first sight those of *B. arundinacea*, but its chief characteristics are the very much ciliate, wavy-auricled and appressed white hairy sheaths, the small leaves, and absence of ciliæ to the palea. Munro speaks of the flowers being monœcious or even diœcious, but the many spikelets I have examined have all proved hermaphrodite. G. Mann's specimens from Protabgarh, Sylhet, called *Betuá* and *Jáma betuá* (Bengali) belong, I consider, to this species.

PLATE No. 34.—*Bambusa polymorpha*, Munro. 1, leaf-branch; 2, part of flower panicle—*of natural size;* 3, culm-sheath—*reduced to about* ¼; 4, do. when young—*of natural size;* 5, leaf-sheaths; 6 & 7, spikelets; 8, empty glume; 9, flowering glume; 10, palea; 11, lodicules; 12, anthers; 13, terminal imperfect flower; 14, ovary with stigmas; 15, caryopsis—*all enlarged.* (All from Kurz' specimens.)

7. BAMBUSA PALLIDA, *Munro in Trans. Linn. Soc.* xxvi. 97.

A graceful bamboo growing in thick clumps. *Culms* 40 to 60 ft. high, 2 to 3 in. in diameter, very smooth, olive green, the young shoots covered with white powder; nodes not very prominent; internodes 18 to 30 in. long, walls thin. *Culm-sheaths* 7 to 12 in. long, about 10 in. broad, usually only little attenuate upwards, and very straightly truncate at top, only when young somewhat roundedly truncate, glabrous or covered with appressed white hairs when young; *imperfect blade* very long, usually longer than the sheath, often 14 in., triangular-acuminate from a broad base which covers nearly the whole top of the sheath, slightly rounded at the edges and then furnished with quite small rounded auricles, the auricles and lower part of the margins furnished with bristles; sparsely appressed black hairy without, glabrous or slightly hairy within; *ligule* very narrow. *Leaves* linear-lanceolate, 4 to 8 in. long, ·5 to ·8 in. broad, rounded or subcuneate at the base, with a very short, hardly ·1 in. long petiole; furnished above with a subulate, twisted, scabrous point; glabrous above, except for the scabrous marginal veins, pale, often nearly white and hirsute beneath; scabrous on the margins; main veins conspicuous, shining, secondary veins 4 to 6, rarely more, intermediate 7 to 9; *leaf-sheaths* glabrous, striate, ending in a prominent smooth callus, and furnished with a rounded erect auricle fringed with a few stiff long bristles, and quickly deciduous; *ligule* very short. *Inflorescence* a large branching, very pale panicle, with spicate branchlets bearing heads with many sterile and few fertile pale spikelets; rachis fistular, that of branchlets slender, wiry, glabrous. *Spikelets* pale, 1 to 1·3 in. long, sometimes curved, bearing usually 1 to 2 small ovate-acute empty glumes, then 1 male or gemmiparous glume, then 3 to 8 fertile flowers, then 3 to 5 imperfect ones gradually decreasing in size; rachilla short, club-shaped,

ciliate at top; *flowering glume* ovate-acute, mucronate, many-nerved, glabrous, minutely pubescent within; *palea* much shorter, acute, 2-keeled, shortly ciliate on the keels, 3 to 5 veins between them. *Lodicules* 3, oblong or narrowly obovate, two rather unequally-sided, large, and the third acute, smaller, all somewhat thickened at base and veined. *Stamens* hardly exserted, *anthers* narrow, apiculate, with 1 or 2 long hairs or not. Ovary narrowly oblong, attenuate upwards into a hairy thickened *style* which soon branches into 3 plumose *stigmas*. *Caryopsis* not seen. B. CRITICA, *Kurz in Journ. As. Soc. Beng.* xlii. ii. 250. DENDROCALAMUS CRITICUS, *Kurz For. Fl. Burma* ii. 559.

Northern and Eastern Bengal, Assam, Upper Burma, extending down to Kambalataung in the Pegu Yoma. It is apparently wild in the hills up to 5,000 or 6,000 feet and cultivated in the plains below.

This species is, as Munro remarks, like *B. Tulda*, and consequently sometimes difficult to distinguish from that species and *B. nutans;* but the very characteristic culm-sheaths, the narrow leaves, and the attenuate ovary really at once distinguish it. Flowering specimens were collected by Hooker and Thomson in Eastern Bengal in 1850 on cultivated plants; and, so far as I am aware, it has not again been found in flower till collected in the Barduar forest, Kamrúp, Assam, in 1890 by Paniram Dás for G. Mann. These specimens bear the native name *Makal* (Assamese). Leaf specimens were collected also by Hooker and Thomson in Cachar (native name *Burwal*, *bakhal*), and at Jowye, Khasia Hills, 3,500 feet (native name *Usken*, Khasia). Besides the flowering specimens referred to above, I identify as this the following with only leaves and culm-sheaths sent by G. Mann from Assam in 1890: from Sibsagar (cultivated under names *Walkthai* (Assamese), *Watoi* (Naga); from Kakadanga river, Naga Hills (wild), under names *Walkthai* (Assamese), *Tesero* (Naga); from the foot of the Mikir Hills (wild) under names *Jowa* (Assamese), *Loto* (Mikir); from Shillong, Khasia Hills, (cultivated) under names *Usken*, *seskien*, *skhen* (Khasia); from Jowai, 4,000 feet, and Sundai Hill in the Jaintia Hills under names *Usken*, *skhen*, *tneng* (Khasia); from Charduar forest, Darrang district, under name *Bijli* (Assamese). I also identify as this species the bamboo collected by myself in 1880 in British Bhutan in the Reyoong and Rilli valleys at 3,000 feet under the name *Pshi* (Lepcha); that collected by T. Anderson in the Teesta valley, 600 to 1,500 feet, in 1868, and called *Pushee;* that collected by Kurz in the Great Rangit valley under the same name; and that found at Pedong, 3,000 feet, under the name *Bongshing* (Bhutia); as well as the one collected by G. A. Gammie at Mongpoo under the name *Pashipo* (Lepcha); and I find that on T. Anderson's specimens in Calcutta Herbarium, Munro has noted them as 'very like *B. pallida.*' I also identify as this a specimen (No. 273) from the Dikrung valley, Daphla Hills, found by J. L. Lister in 1874. Finally, it has recently been received from J. W. Oliver from the moist, evergreen forests of the Bhamo district, Upper Burma, at 800 feet, under the names *Gyawa* (Burmese), *Madankran*, *maipyu* (Kachin); and after carefully reading Kurz' description in the *Forest Flora of Burma* and examining his specimens and his drawing of the culm-sheath, I conclude that his *Dendrocalamus criticus* from the Kambalataung, the highest point of the Pegu Yoma Range, is in all probability this species also. In Assam it is used for many purposes—for building, for making baskets and mats and for vessels to hold water.

PLATE No. 35.—*Bambusa pallida*, Munro. 1, leaf-branch; 2, part of flowering panicle—*of natural size;* 3, culm-sheath—*reduced;* 4, leaf-sheath; 5, spikelet; 6, fertile flower; 7, palea; 8 & 9, lodicules; 10, anther; 11, ovary, style and stigmas—*all enlarged.* (Nos. 1, 2, 6 from Hooker's specimens; rest from G. Mann's.)

8. BAMBUSA AFFINIS, *Munro in Trans. Linn. Soc.* xxvi. 93.

A low, tufted, evergreen, shrubby bamboo. *Culms* 15 to 20 ft. high by 1 to 1·5 in. in diameter, pale green or striped green and white, striate, appressed-pubescent; nodes slightly thickened, marked with black hairs below; internodes 1 to 2 ft. long, hollow. *Culm-sheaths* 4 to 6 in. long by as much broad, bright green when young, afterwards straw-coloured, glabrous or with small patches of brown, appressed hairs, rounded at top; *imperfect blade* 1 to 2 in. long, ·3 to ·5 in. broad, longer on young shoots, lanceolate, usually recurved, appressed-brown-hairy within, slightly rounded at base and decurrent in a very narrow entire wing on the top of the sheath; *ligule* narrow, entire. *Leaves* 6 to 10 in. long, 1 to 1·5 in. broad, lanceolate or oblong-lanceolate, rounded or attenuate at base into a ·2 in. long petiole; acuminate above in a scabrous twisted point; smooth above, except the scabrous points on marginal veins, scabrid below and pale-coloured, scabrous on the edges; main vein rather prominent, secondary veins 8 to 10, intermediate 6 to 8, pellucid glands many, giving the appearance of transverse veinlets beneath; *leaf-sheaths* striate, the back covered with stiff brown hairs, keeled, ending above in a short callus, and produced beyond it to a length of ·1 to ·2 in. to meet the broad *ligule*. *Inflorescence* a terminal spike or panicle, usually on leafy branchlets; rachis glabrous, 4 to 7 in. long in the internodes, which bear 2 to 3 branchlets with few shining, about 1 in. long, coriaceous spikelets in small verticils. *Spikelets* 6- to 10-flowered, very glossy, pale brown; rachillæ short, shortly bearded at the apex, striate; *flowering glume* long, acuminate, more than 20-nerved, folded at the base; *palea* much narrower, 2-keeled, ciliate on the keels, 7-nerved between them, 4-nerved outside. *Lodicules* 3, rather thick, the two larger ones often united at the base, many-nerved and somewhat folded. *Ovary* almost obovate, almost hairy at the apex and tapering into a *style* cleft into three *stigmas*. *Kurz For. Fl. Burma* ii. 551.

Eng Forests of Martaban in Burma, east of the river Sittang.

This is usually a shrubby species, in habit not unlike *B. lineata*, but the spikelets, which unfortunately I have never been able to examine, are very different. Munro, quoting Brandis, who obtained it in flower in the Yônzalin valley under the name *Theeshe*, describes it as scandent; but Kurz, who must have known it growing, calls it a low bushy species, and this is the character it shows in cultivation in Calcutta, where it is common in the Botanic Garden on the edge of the muddy river bank. Kurz gives the name '*Thaikwa*,' the same as that of *B. Tulda* and *B. burmanica*. I regret that I am unable to figure the flowers.

PLATE No. 36.—*Bambusa affinis*, Munro. 1, leaf-branch; 2, culm-sheath; 3, leaf-sheath—*of natural size* (from Royal Botanic Garden, Calcutta, living specimens).

9. BAMBUSA KHASIANA, *Munro in Trans. Linn. Soc.* xxvi. 97.

A graceful bamboo with single culms from a creeping rootstock. *Culms* 30 to 40 ft. high, 1 to 1·4 in. in diameter, fistular, rather soft, sometimes variegated with transverse blotches when young, dark olive green, with a whitish ring below the node and a bluish ring above, clothed with appressed golden hairs when young, afterwards smooth; nodes not prominent; internodes 5 to 15 in., walls thin, ·1 to ·3 in. thick. *Culm-sheaths* 5 to 6 in. long, 4 to 5 in. broad, striate, covered with dense tawny appressed hairs, straight, truncate at the top which is but little narrower

than the base; *imperfect blade* as long or longer than the sheath, middle portion thickened, narrow (1 in. at base), cuspidately acuminate, the sides widened out into large inflated membranous wings, broadly rounded on the top of the sheath; *ligule* narrow, ·05 in. long. *Leaves* pale coloured, 4 to 9 in. long, 1 to 1·5 broad, lanceolate or oblong-lanceolate, rounded at base into a ·2 to ·3 in. petiole; ending above in a subulate, setaceous, shaggy point; glabrous on both sides; main veins prominent, secondary veins 6 to 8, inconspicuous, intermediate 5 to 7; *leaf-sheaths* glabrous, striate, ending in a broad callus and a minute auricle furnished with a few long very deciduous slender bristles; *ligule* elongate, truncate. *Inflorescence* a very elongated panicle, with spicate branchlets, bearing distant heads of few spikelets partly short sterile, partly long fertile; rachis smooth, rather soft, striate. *Spikelets* ·6 to ·8 in. long; at first cylindric, then flattened, glabrous, bearing 1 to 4 empty glumes or gemmiparous glumes, then 2 to 3 fertile flowers, then 1 to 2 terminal imperfect flowers, rachilla striate; *empty glumes* short, ovate mucronate, darker at edges, glabrous, veins prominent; *flowering glume* similar but longer and hairy within at the point, about 11- to 13-nerved; *palea* as long as or longer than the flowering glume, many-nerved, short ciliate on the keels. *Lodicules* ovate-orbicular, blunt, many-nerved, very shortly fimbriate. *Stamens* with obtuse anthers. *Ovary* linear-oblong, attenuate into a *style* with 3 long narrow *stigmas*. *Caryopsis* not seen.

Khasia and Jaintia Hills, Assam, also Manipur. Collected in June 1850 by Hooker and Thomson at Jasper Hill, Mahadeb, (No. 496) and at Churra (No. 1097)—2,000 to 4,000 ft.; leaves and culm-sheaths by G. Mann in 1889 near Jowai and Sundai, Jaintia Hills, 1,000 to 4,000 ft. It was also collected in flower by C. B. Clarke at Jaintiapur, 1,000 ft., in 1885 (No. 42454), and at Manipur (No. 42322). Thus, the known flowering years were 1850 and 1885.

In describing this species from the specimens at Kew, Munro has taken the culm-sheaths on the sheet of Hooker's No. 496 as belonging to it, but in reality they belong to *Arundinaria Griffithiana*. Mann's specimens, which bear the names *Serim*, *tyrah* (Khasia), *Tirriah* (Naga), *Wa-chiusa* (Cachari), *Bewar* (Mikir), *Chaltur* (Kuki), consist of leaves which agree in every respect with those of Hooker's specimens; and I have therefore no reason to doubt that they, with their extraordinary culm-sheaths, belong here. Hooker's specimens bore the native names *Tumar*, *tomar*, but those sent by Mann as "*Bambusa khasiana-Tumoh* (Khasia)" are another species altogether. The remarkable sheaths, shaggy tips to the leaves, and long distantly-flowered fistular panicles characterize this bamboo, which is said by Mann to be used in building huts and for basket-work in general.

PLATE No. 37.—*Bambusa khasiana*, Munro. 1, leaf-branch; 2, part of flower-panicle; 3, summit of young shoot showing culm-sheaths—*of natural size;* 4, leaf-sheaths; 5, apex of leaf; 6, spikelet; 7, flowering glume; 8, palea; 9, lodicule; 10, anthers; 11, ovary and stigmas—*enlarged.* (Nos. 2, 4, 5 from Hooker's specimens, Nos. 1, 2 from G. Mann's, rest from C. B. Clarke's.)

10. BAMBUSA NANA, *Roxb. Hort. Beng.* 25 (1814).

A thickly growing, evergreen, cæspitose shrub. *Culms* glabrous, smooth, 6 to 10 ft. high, ·5 to 1 in. in diameter, green when young, afterwards yellow, hard, much

branched from the base; nodes rather prominently thickened; internodes usually 8 to 15 in. long. *Culm-sheaths* green at first, then yellow, stiff, glabrous, striate, 4 to 6 in. long, 2 to 3 in. broad, slightly attenuate upwards and rounded at the top; *imperfect blade* 2 to 3 in. long, linear, acuminate, decurrent at the base on either side along the rounded part of the sheath, somewhat black, appressed-hairy or glabrous above, hairy beneath, deciduously ciliate on the edges; *ligule* narrow, entire. *Leaves* distichous, 2 to 4 in. long, ·5 in. broad, linear-lanceolate; narrowed in a rounded or slightly tapering base into a very short petiole; above ending in a subulate twisted point; smooth above, whitish or glabrous and minutely pubescent beneath; main vein faint, pale beneath, secondary veins 3 to 6, intermediate 7 to 8, no transverse veinlets, but very faint pellucid glands; *leaf-sheaths* smooth, striate, ending in a prominent callus and auricled at the mouth, the auricle fringed with a few long stiff bristles; *ligule* short. *Inflorescence* a rather short, diffuse, leafy panicle with few spikelets solitary or clustered. *Spikelets* ·5 to 1·5 in. long, ·2 in. broad, very glabrous, straw-coloured, bearing 5 or more flowers, separated by glabrous, flattened, ·1 to ·2 in. long rachillæ, the terminal flower only imperfect; *empty glumes* none, or very rarely one; *flowering glumes* ·6 to ·7 in., glabrous, many-nerved, ovate-acute; *palea* shorter than flowering glume, 2-keeled, minutely ciliate only at the tip, many-nerved. *Lodicules* 3, unequal, ·1 to ·2 in. long, entire, linear, somewhat concave or thickened below, usually 2-nerved. *Stamens* exserted, pendulous; *anthers* blunt or slightly apiculate, yellow. *Ovary* obovate, rough, pubescent above; *style* very short, almost immediately dividing into 3 long feathery *stigmas*. *Caryopsis* elliptic, furrowed, roughly hairy above, and ending in a short beak. *Roxb. Fl. Ind.* ii. 190; *Herb. Ham. in Wall. Cat.* 5036; *Munro in Trans. Linn. Soc.* xxvi. 89; *Kurz For. Fl. Burma* ii. 551: *Ind. Forester* i. 339; *Voigt Hort. Sub. Calc.* 719. BAMBUSA GLAUCA, *Loddig. Cat. et Lindl. in Penny Cyc.* (1835); *Schultes Syst. Veg.* vii. 1355; BAMBUSA CÆSIA, *Sieb. & Zucc., according to Munro.* BAMBUSA GLAUCESCENS, *Sieb. Cat., fide Munro.* BAMBUSA STERILIS, *Kurz in Miq. Ann. Mus. Bot. Lugd. Bat.* ii. 285. BAMBUSA VIRIDI-GLAUCESCENS, *Carr. in Rev. Hortic.* (1869) 292. ISCHUROCHLOA FLORIBUNDA, *Büse in Miq. Pl. Jungh.* 390; *Miq. Fl. Ind. Bat.* iii. 422. ARUNDINARIA GLAUCESCENS, *P. de Beauv. Agros.* 144; *Röm. and Sch. Syst. Veg.* ii. 846; *Nees Agros. Bras.* 526; *Kunth Enum.* 426; *Rupr. Bamb.* 23, *tab.* 1, *fig.* 3; *Hassk. Cat. Hort. Bogor.* (1844) 19; *Steudel Syn.* 334; *Zoll. Cat.* 56; *Miq. Fl. Ind. Bat.* iii. 413; *Munro in Trans. Linn. Soc.* xxvi. 22. LUDOLFIA GLAUCESCENS, *Willd. Mag. Gesellsch. Nat. Freunde Berlin* (1808) 320; *Sprneg. Syst. Veg.* i. 328; *Link Hort. Berol.* i. 102, ii. 308. PANICUM ARBORESCENS, *Lam. Enc. Meth.* iv. 749. PANICUM ARBORESCENS, *Linn. according to Nees., but Munro points out that Röm. and Sch. say* P. ARBORESCENS and GLAUCESCENS, *Lam. and of gardens, not of Linn.* TRIGLOSSUM ARUNDINACEUM, *Fisch.* and *Röm. and Sch. Syst. Veg.* 846.

A native of China and Japan, cultivated in India, Malaya, and Ceylon in various places, such as the Royal Botanic Gardens at Calcutta and Peradeniya, in Chittagong, Madras, Rangoon, Singapore and elsewhere. The Chinese bamboo.

I have been in doubt whether to describe this species, but as it is admitted by Roxburgh and Kurz, I think it best to include it, and to figure it, as also the similarly introduced and more common *Bambusa vulgaris*. It makes excellent stiff, closely-growing hedges, and is hardy. Kurz gives the Burmese name as *Pa-lau-pinan-wa*, and the Malay names as *Bamboo tjennah aloos, bamboo hower tjeenah.* Specimens sent by L. Wray Junior (No. 1560) from Gunong Brumbu, Pahang, 7,000 feet, give the Malay name as *Bulu perindu*: it is not said whether they were from cultivated plants or not.

PLATE No. 38.—*Bambusa nana*, Roxb. 1, leaf-branch; 2, part of flower-panicle; 3 & 4, culm-sheaths—*of natural size;* 5 & 6, spikelet; 7, flowering glume; 8, palea; 9, lodicules; 10, anther; 11, ovary and stigmas; 12, caryopsis—*enlarged.* (No. 4 from Kurz' picture in the Herbarium of the Royal Botanic Garden, Calcutta, the rest from my own or Kurz' specimens.)

11. BAMBUSA BALCOOA, *Roxb. Hort. Beng.* 25 (1814).

A tall, stout, cæspitose bamboo. *Culms* dull greyish-green, 50 to 70 ft. high, 3 to 6 in. in diameter, branched from the base, the lower nodes giving off leafless, hard branchlets; nodes swollen, with a whitish ring above them, hairy below; internodes 8 to 18 in. long, walls thick. *Culm-sheaths* of two descriptions; lower ones short and broad, densely appressed-hairy on the upper surface, ciliate on the edges and on the rounded top; *imperfect blade* short, triangular, decurrent into short, fringed auricles; upper ones 10 to 14 in. long, 8 to 10 in. broad, almost glabrous, striate, truncate above, ciliate on the edges; *imperfect blade* 6 to 8 in. long, 3 to 4 in. broad, sharp at the apex and with recurved margins, closely hairy below, striate above, rounded at the base, and then again decurrent on the sheath in a narrow band bearing a few long ciliate hairs; *ligule* ·2 to ·3 in. broad, dentate. *Leaves* oblong-lanceolate, 6 to 12 in. long, 1 to 2 in. broad; rounded or subcordate at the base into a short petiole; the apex with a twisted, scabrous, setaceous point; glabrous above, pale beneath and hairy when young, especially below; scabrous-ciliate on both edges; main vein prominent, shining beneath, secondary veins 7 to 11, intermediate 6 or 7, many pellucid glands which often give the appearance of prominent transverse veinlets on the lower surface; *leaf-sheath* striate, appressed-white-hairy, truncate above with a narrow callus, and sometimes furnished with a very few stiff waved deciduous bristles; *ligule* membranous, broadly triangular. *Inflorescence* a large compound panicle, bearing spicate branches with bracteate heads of spikelets; rachis pubescent or scurfy, striate, swollen above. *Spikelets* ovoid, lanceolate, flattened, ·3 to ·6 in. long, ·2 to ·3 in. broad, with 0 to 2 empty glumes, then 4 to 6 hermaphrodite flowers, then a terminal imperfect flower on a short flattened rachilla; *empty glumes* ovate-acute many-nerved; *flowering glumes* similar but larger and ciliate on the edges; *palea* as long as flowering glume, ovate-acute, 2-keeled, long ciliate on the keels, indistinctly veined. *Lodicules* 3, ovate or obovate, 3- to 5-nerved, fimbriate on the edges. *Stamens* hardly exserted, *anthers* glabrous, the connective ending in a short, dark, sometimes hairy point. *Ovary* broadly ovoid, acuminate, hairy, with a hairy *style* branching into three long plumose *stigmas*. *Caryopsis* not seen. *Roxb. Fl. Ind.* ii. 196: *Icon. ined.* 1402; *Munro in Trans. Linn. Soc.* xxvi. 100; *Brandis For. Flora* 567. BAMBUSA CAPENSIS, *Ruprecht Bamb.* 54, *tab.* xiii. *fig.* 54; *Steudel Syn.* 330. B. VASARIA, *Herb. Ham. in Wall. Cat.* 5025. DENDROCALAMUS BALCOOA, *Voigt Hort. Sub. Calc.* 718.

Assam, Lower Bengal and Bihar extending to Goruckpore. Cultivated at the Cape of Good Hope, and not uncommon in gardens there.

This well-marked bamboo is recognized by the large culm-sheaths which resemble those of *Dendrocalamus Hamiltonii*, by the long leafless shoots given off from the lower nodes, by the leaves with rounded bases and hairy sheaths, the flattened soft spikelets and long stigmas. It is probably the best and strongest species for building purposes, and is greatly esteemed in Calcutta, but it is not handsome, and would hardly be chosen

to plant for ornamental purposes. It is much used for scaffolding, and is very durable if well seasoned by immersion in water. It is called *Balku bans* (Bengali) and *Baluka* (Assamese); and to this species I attribute specimens sent by G. Mann under the names *Sil barúa*, *teli barúa*, from Sylhet, *Wamnah*, *beru* from the Garo Hills, and those collected by myself in the Western Duars under the name *Boro bans*. It has been but rarely collected in flower: once by Roxburgh and once by Hamilton; by Hooker in the Purnea district in 1849; by G. Mann in Goalpara in 1876; in Kamrúp (Pani Ram Dás, collector) in 1889; and by Captain Wood, Conservator of Forests, in Goruckpore, in 1881.

PLATE No. 39.—*Bambusa Balcooa*, Roxb. 1, leaf-branch; 2, part of flower-panicle—*of natural size*; 3 & 4, culm-sheaths—*reduced*; 5, leaf-sheath; 6, spikelet; 7, flowering glume; 8, palea; 9, lodicule; 10, anther; 11, ovary with style and stigmas—*enlarged*. (No. 2 from Mann's Goalpara specimens; rest from Calcutta Botanic Garden specimens.)

SECTION II.

12. BAMBUSA VULGARIS, *Schrad. in Wendl. Collect. Pl.* ii. 26, *t.* 47.

A moderate-sized bamboo with rather distant culms. *Culms* bright green, yellow, or striped green and yellow, polished, shining, 20 to 50 ft. high, 2 to 4 in. in diameter or more, early branching; nodes hardly raised, but having a narrow ring usually covered with brown hairs; internodes 10 to 18 in. long; walls rather thin. *Culm-sheaths* 6 to 10 in. long, 7 to 9 in. broad, often beautifully streaked when young with green and yellow, rounded at top and concavely truncate, striate, clothed on the upper surface with thick appressed brown hairs, edges ciliate; *imperfect blade* somewhat triangular, acute, 2 to 6 in. long and up to 4 in. broad, appressed-hairy on both surfaces, margins revolute, rounded at the base and decurrent on the sheath, finally ending on both sides in a round, falcate, conspicuous auricle which is fringed by wavy stiff bristles; *ligule* ·2 to ·3 in. broad, dentate, sometimes long-fimbriate. *Leaves* linear-lanceolate, pale green, 6 to 10 in. long, ·7 to 1·7 in. broad, rounded or attenuate at the base into a ·2 in. long petiole; ending above in a long twisted scabrous point; glabrous on both surfaces, except occasionally somewhat hairy beneath when young; scabrous on the margin and on adjacent nerves; main vein narrow, pale, secondary veins 6 to 8, intermediate 8 to 9, frequent pellucid glands giving the appearance beneath of transverse veinlets; *leaf-sheaths* striate, laxly hairy, ending in a smooth ciliate callus and a smooth rounded auricle with very few deciduous bristles; *ligule* short, shortly ciliate. *Inflorescence* a large leafy compound panicle bearing spicate branches with heads of spikelets in bracteate clusters of 3 to 10, the clusters larger at the nodes; rachis rounded or somewhat furrowed, scurfy, end segments hairy. *Spikelets* ·6 to ·8 in. long, oblong, acute, compressed, having the appearance of being bifid down the middle; bearing 1 to 2 empty glumes, then 6 to 10 flowers, and finally an imperfect flower; rachillæ cuneate, glabrous, not apparent; *empty glumes* ovate-acute, ciliate at tip, many-nerved; *flowering glumes* similar but larger; *palea* as long as, or a little longer than, flowering glume, bluntly acute, 2-keeled, white-ciliate on the keels, faintly 3-nerved. *Lodicules* unequal, usually two, ovate-oblong, the third longer, acute, long white-ciliate, 3-veined, very membranous. *Stamens* exserted, purple; *anthers* narrow, blunt, hairy, apiculate. *Ovary* narrowly oblong, hairy, surmounted by a long, thin, hairy *style* divided near the top into 3 short plumose *stigmas*. *Caryopsis* not known. *Roth Nov.*

Plant. Spec. 198 [1821] (*excl. Syn. Roem. and Sch. Syst. Veg.* 1337 *according to Munro*); *Rupr. Bamb.* 47, *tab.* xi. *fig.* 47; *Steudel Syn.* 329; *Griseb. Fl. Br. W. Ind.* 528; *Miq. Fl. Ind. Bat.* iii. 417; *Dalz. and Gibs. Bomb. Flora* 299; *Munro in Trans. Linn. Soc.* xxvi. 106; *Beddome Flora Sylv.* ccxxxii; *Brandis For. Flora* 568; *Kurz For. Fl. Burma* ii. 551 (*in analysis*): *Ind. Forester* i. 339; *Rivière Les bambous* 191, figs. 18, 19. BAMBUSA THOUARSII, *Kunth Not. Gen. Bambusa in Journ. de Phys.* 148 (1822); *Syn. Pl. Æquin.* i. 252: *Rev. Gram.* i. 323 *t.* 73, 74: *Enum.* 431: *Suppl.* 356; *Rupr. Bamb.* 48, *tab.* xi. *fig.* 48; *Steudel Syn.* 329; *Desf. Cat.* 22 (1829); *Schultes Syst. Veg.* vii. 1347; *Nees in Linn.* 466; *Thw. Enum. Pl. Zeyl.* 375; *C. P.* 3252. BAMBUSA SURINAMENSIS, *Rupr. Bamb.* 49, *tab.* xi. *fig.* 49; *Steudel Syn.* 329. BAMBUSA SIEBERI, *Griseb. Fl. Br. W. Ind.* 528. BAMBUSA HUMILIS, *Reich. MS.* (*teste Rupr. Bamb.* 50). BAMBUSA ARUNDINACEA, *Moon Cat.* 26; *Ait. Hort. Kew. Ed.* ii. 316. BAMBUSA, *Wall. Cat.* 5034. BAMBUSA STRIATA, *Loddiges; Munro in Trans. Linn. Soc.* xxvi. 121; *Curtis Bot. Mag.* xxx. 1874, *t.* 6079 (VAR. STRIATA). NASTUS THOUARSII, *Spr. Syst. Veg.* ii. (1825) 113.

Cultivated and run wild over the warmer parts of India, Burma, Malaya, and Ceylon. Its original country is uncertain; but it is found in Java and the Moluccas generally, in Mauritius, Bourbon, Madagascar, the Cape, St. Helena, and Algeria, the West Indian Islands, Mexico, Central and South America; and it is cultivated in most tropical gardens and in hothouses in Europe, as in the Royal Gardens at Kew and the Glasnevin Gardens at Dublin. The "Index Kewensis" mentions Mexico as its indigenous locality, and Kunth (Rev. Gram.) gives Madagascar and Bourbon. Obtained in flower by Thwaites (Ceylon) in 1863; by E. G. Chester (Chittagong) in 1879; by Hooker (Chittagong) in 1851; by King (Calcutta Botanic Garden) in 1890; by Ridley (Singapore Garden) in 1892; and by others without date given.

VAR. *striata* is rather smaller in size, has the culms striped with yellow and green, the branchlets yellow, and the leaves somewhat smaller and paler, otherwise it does not appear to differ from the ordinary green kind. It appears to come from China and Japan, and is probably the result of cultivation.

Though not indigenous, this bamboo is so common in India that any work which proposed to assist in identifying species would be incomplete without reference to it. Dalzell and Gibson refer to it as if it were wild, though there is some doubt about the vernacular name *Kulluk* given by them, for all the specimens I have received under that name have proved to be *B. arundinacea.* It is cultivated in the Poona and Satara districts, but not in the south, according to Talbot. In Bengal it is known as *Basini* or *bansini*, that is, 'female bamboo' (see Babu Protapa Chandra Ghose in Journ. Agri.-Hortl. Soc. Calcutta, Vol. VIIN.S., p. xci). It is common in Chittagong and there known as *Bariála.* Specimens received from Khorda, Orissa, from Babu Sree Dhur Chakravarti, bear the name *Sundrogai.* In Ceylon it is called *Una*, and used for building purposes. According to Kurz, the Malays distinguish four varieties according to the colour of the culms and branches, viz.—

Var. 1. Culms and branches green—*Hower hedyoo, hower gullies, ampel.*
,, 2. Culms yellow or occasionally striped—*Hower konneng, koonieng.*
,, 3. Culms yellow and green striped—*Hower sehah, kooda.*
,, 4. Culms green, blotched with black when old—*Tootool.*

Kurz also speaks of it as wild in Java as well as cultivated. There is a long account of it in Rivière's 'Les Bambous' with excellent pictures of the rhizome and culm-sheath. The part of India in which this species is most common and most commonly cultivated is probably the Concan, whence specimens have been received. I also identify with this the *Bulo pan* collected by L. Wray Jr. in Perak (No. 141), also the *Wanet* (Burmese) sent from Pegu by P. J. Carter and from Tenasserim by W. T. McHarg. The striped variety is very ornamental, and deserves a wider cultivation in gardens in India. At the Saharanpur Botanic Garden it is regularly propagated both by cuttings and by layers. There is also another variety, a portion of the culm of which is figured by Kurz in *Ind. Forester*, vol. i, in which the internodes are swollen into a flask shape.

PLATE No. 40.—*Bambusa vulgaris*, Schr. 1, leaf-branch; 2, part of flowering branch; 3, portion of young culm—*of natural size*; 4, culm-sheath (var. *striata*)—*reduced to about* ¼; 5, young branch (var. *striata*)—*of natural size*; 6, leaf-sheath; 7, spikelet; 8, empty glume; 9, flowering glume; 10, palea; 11, lodicule; 12, anther 13, ovary with style and stigmas—*enlarged* (all from Calcutta Botanic Garden specimens).*

13. BAMBUSA BINGHAMI, *n. sp. Gamble.*

A wiry bamboo. *Culms* not known. *Leaves* linear or linear-lanceolate, 3 to 6 in. long, ·4 to ·6 in. broad; rounded at the base into a very short, scarcely ·05 to ·1 in. long petiole; ending above in a long, acuminate, twisted tip which is not scabrous; smooth on both sides; main vein slender, secondary veins 5 to 6 pairs, intermediate 7; *leaf-sheaths* smooth, striate, ending in a narrow callus and furnished with a few white stiff ciliæ at the somewhat produced mouth; *ligule* very short. *Inflorescence* a short terminal leafy panicle bearing loose heads of few (2—4) spikelets; rachis short, joints sometimes geniculate, clavate. *Spikelets* ·5 to ·6 in. long with 1 to 2 empty glumes, 5 to 6 fertile flowers and 1 terminal imperfect one, much flattened, the flowers spreading, distichous; rachillæ broad-clavate, flexuose, visible; *empty glumes* striate, mucronate; *flowering glume* ovate-acute, smooth, mucronate, many nerved; *palea* as long as flowering glume or longer, conspicuous, blunt, long-white-fringed on the keels. *Lodicules* rounded, obtuse, long-ciliate on the upper margins, one edge hardened, 3- to 5-nerved. *Stamens* partly exserted; *anthers* linear, blunt or with a single hair at the apex. *Ovary* elongate, narrow, hairy above, *style* very speedily divided into 3 short white plumose *stigmas*. *Caryopsis* linear-oblong, beaked, furrowed on one side, hairy on the beak.

Lower Burma: received through Major Bingham, Conservator of Forests in Tenasserim, from the Nyaungdaungle forest.

Very little is known of this species, which seems not to differ very greatly from the Chinese *B. flexuosa*, Munro. Its name is *Ngachatwa* (Burmese).

PLATE No. 41.—*Bambusa Binghami*, Gamble. 1, leaf-branch; 2, flowering branch—*of natural size*; 3, spikelet; 4, flowering glume; 5, palea; 6, lodicules; 7, anther; 8, ovary and stigmas; 9, caryopsis—*enlarged.*

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* Plates 73 and 74 of Kunth's 'Revisio Graminum,' vol. i, are also good.

14. Bambusa Kingiana, *n. sp. Gamble.*

A large bamboo. *Culms* 60 to 70 ft. long, up to 4 in. in diameter. *Culm-sheaths* not known. *Leaves* 10 to 12 in. long, 1 to 2·5 in. broad, linear-lanceolate; unequally rounded at the base into a rather thick, ·2 to ·3 in. long petiole; tip acuminate, scabrous; smooth above except the scabrous marginal veins, pale and sparsely hairy beneath afterwards glabrous; scabrous on the edges; main vein thick, prominent, shining, secondary veins 10 to 14 pairs, intermediate 5 to 7, pellucid glands giving the appearance of transverse veinlets beneath; *leaf-sheaths* smooth, somewhat striate, ciliate on the edges, ending in a broad shining callus and a very small rounded naked auricle; *ligule* rather broad, dentate, often long-fimbriate, one side longer than the other. *Inflorescence* a compound leafy panicle, bearing spicate branchlets on which are borne somewhat regularly-spaced clusters of few (1 to 6) purple-tipped spikelets; *rachis* flexuose, joints flattened on one side, ·5 to 1 in. long, pubescent at first, then glabrous, bracts small. *Spikelets* ·5 in. long, ·2 in. broad, purplish, flattened, with 2 empty glumes, 4 to 6 fertile flowers, and 1 terminal imperfect flower; rachilla about ·1 in. long, clavate, flattened; *empty glumes* ovate-acute, mucronate, ciliate at the edges; *flowering glumes* similar, but larger; *palea* oblong, acute or acuminate, long ciliate on the keels, 2-nerved between. *Lodicules* 3, two ovate blunt, one lanceolate, all long-fimbriate, usually 3-nerved. *Stamens* half exserted; anthers narrow, apiculate with a tuft of 3 or more penicillate hairs. *Ovary* broadly ovoid, stalked, hairy, surmounted by a short thick *style*, almost at once separating into 3 purple plumose *stigmas*. *Caryopsis* not known.

Upper Burma: sent by J. W. Oliver from Petsut, Katha district, under the name *Thaikwabo* (Burmese).

This pretty species has at first the appearance of a *Dendrocalamus*, but seems to be a true *Bambusa*. The penicillately tufted anthers are characteristic. I am glad to associate with it the name of Dr. G. King, under whose auspices and with whose assistance this work has been done.

Plate No. 42.—*Bambusa Kingiana*, Gamble. 1, leaf-branch; 2, flowering branch—*of natural size;* 3, spikelet; 4, empty glume; 5, flowering glume; 6, palea; 7, lodicules; 8, anther; 9, ovary and stigmas; 10, leaf-sheath—*enlarged* (from J. W. Oliver's specimens).

SECTION III.

15. Bambusa lineata, *Munro in Trans. Linn. Soc.* xxvi. 118.

A thickly growing, reed-like, large-leaved shrub with short culms. *Culms* green or green striped with yellow, ·5 to 1 in. in diameter, much branching when young, sparsely covered with spreading stiff bristles; nodes marked by a prominent ring, the base of the fallen sheath; internodes long, 16 to 24 in., rough, especially below the node. *Culm-sheath* striped when young, about 6 in. long, 3 to 4 in. broad, covered, when young, with appressed golden brown hairs, especially at the base, afterwards nearly glabrous, ciliate on the margins, truncate at top; *imperfect blade* ovate cuspidate, usually as long as the sheath, 2 in. broad or more, erect, many-nerved, rounded at the base to about ·4 in., and then again spreading out in a narrow (·2 to ·3 in.) band along the top of the sheath, the band long-ciliate, hairy; *ligule* ·05 in. broad, closely dentate and long-fimbriate. *Leaves* very variable in size, those on young shoots often 15 in.

long and up to 3 in. broad; those on older branches and flowering branches 10 to 12 in. long by 1 to 1·5 in. broad; stiff, brittle, dull green above, pale beneath, ovate-lanceolate or linear-lanceolate; unequally rounded at the base into a very short (·1 to ·2 in.) broad petiole; above ending in a long, twisted, scabrous point; glabrous above and beneath, except for scabrous points on the marginal veins above; scabrous-serrate on the edges; secondary veins 8 to 12, intermediate 5 to 7, many pellucid glands which give the appearance of transverse veinlets beneath; *leaf-sheaths* striate, hairy, keeled, truncate at top with no or only a very small callus, ending in long, falcate, deciduous auricles which are fringed with long stiff bristles; *ligule* short, very long and stiffly fimbriate. *Inflorescence* a terminal spike or panicle at the ends of leafy branchlets, bearing clusters of sessile spikelets supported by a truncate bract; rachis rounded or flattened on one side, striate. *Spikelets* ovate-acute, ·4 to ·5 in. long, about ·2 in. broad, much compressed, and often spirally twisted, bearing usually 1 to 2 empty glumes, then about 10 fertile flowers, then a terminal imperfect flower; rachillæ short, glabrous; *empty glume* ovate, long-mucronate, 5- to 7-veined; *flowering glume* similar but longer, and white-ciliate on the margins; *palea* a little shorter than the flowering glumes, narrow, 2-keeled, minutely ciliate on the keels, sometimes bifid at the apex. *Lodicules* apparently none. *Stamens* exserted; *anthers* narrow, the connective apiculate with a penicillate point; *filaments* often apparently monadelphous but separable. *Ovary* oblong, whitish, pubescent, gradually passing into an elongated *style* which is finally divided into three purple plumose *stigmas*. *Caryopsis* not known. BAMBUSA RUMPHIANA, *Kurz in Journ. As. Soc. Beng.* xxxix. (1870), 86; *Ind. Forester* i. 341. LELEBA LINEATA, *Rumph. Herb. Amb.* vi. tab. 1, p. 5. LELEBA RUMPHIANA, *Kurz in Cat. Hort. Bogor.* (1866), 20. BAMBUSA AMAHUSSANA, B. ATRA, B. PICTA, B. PRAVA, Ldl. (according to Munro and Kurz.)

Throughout the Malay Archipelago and the Moluccas, extending northwards to the Andaman Islands, where it was gathered at Rutland Island by Dr. Prain in December 1890. Cultivated in the Botanic Gardens at Buitenzorg, Java; at Peradeniya, Ceylon, and at Calcutta. It is found in marshy coast forests.

This is a very remarkable species, which Kurz thought would prove to belong to a new genus when the caryopsis is found. It is characterized by its shrubby habit; constant flowering; many-flowered, long-mucronate, *Bromus*-like spikelets; brittle leaves and peculiar culm-sheaths. Kurz in *Ind. Forester* i. 341, enumerates 5 varieties bearing the Malay names of *Leleba dyohat, pootee, ietam, tootool, soorat.* I think that the name of *B. lineata* must take precedence of Kurz' name of *B. Rumphiana*, much as it may be regretted; for Rumphius called it *Leleba lineata*, and Munro published it as *Bambusa lineata* in the same year (1866) in which Kurz gave it the name of *Leleba Rumphiana*. I have examined many flowers and failed to find the lodicules, but in a picture by Kurz in the Herbarium of the Royal Botanic Garden, Calcutta, there are given what I take to be intended for small acute glabrous lodicules, though they may be the bases of the filaments which have themselves disappeared. The fruit also is not known and should be searched for; for though constantly found in flower in the Botanic Gardens at Calcutta and Peradeniya, it has not yet been known to produce seed.

PLATE No. 43.—*Bambusa lineata*, Munro. 1, leaf and flower branch; 2, leaf-sheath; 3 & 4, culm-sheaths, outside young and inside older—*of natural size*; 5, spikelet; 6, spikelet, from a Ceylon specimen; 7, empty glume; 8, flowering glume; 9, palea;

10, anther; 11, ovary, style and stigmas. (Fig 4. from a picture by W. D. Alwis kindly lent by Dr. H. Trimen of the Peradeniya Botanic Gardens; the rest, except 6, from fresh Calcutta specimens.)

SECTION IV.

16. Bambusa schizostachyoides, *Kurz MS.*

An evergreen, arboreous, tufted bamboo. *Culms* 20 to 30 ft. high, 3 to 4 in. in diameter, green, glossy; nodes not thickened; internodes 1·5 to 2 ft. long, walls very thin; branches 1 to 4 from each node, leaf-bearing below, flower-bearing above. *Culm-sheaths* unknown. *Leaves* lanceolate to linear-lanceolate, 4 to 7 in. long, ·5 to 1·3 in. broad, rounded or attenuate below into a short ·1 in. petiole; above ending in a subulate, twisted, scabrous point; scabrous above along marginal veins and hairy near the base, otherwise smooth; pale and glabrous beneath; scabrous on one or both edges; main vein shining, conspicuous, secondary 5 to 6, intermediate 5; *leaf-sheaths* striate, hispid at first, then glabrous, ending abruptly without callus, and furnished with 6 to 10 long, white, twisted, stiff bristles on a long falcate auricle, ciliate at the edges; *ligule* long. *Inflorescence* a spicate terminal panicle, bearing bracteate heads of few spikelets; bracts narrow, smooth, truncate or acuminate; rachis truncate, pubescent, joints about 1 in. long. *Spikelets* smooth, cylindric, ·5 to ·6 in. long, bearing 1 to 2 empty glumes, then 2 to 3 fertile flowers, then a terminal imperfect one, rachillæ short, glabrous; *empty glumes* ovate, mucronate, many-nerved; *flowering glumes* similar but longer, ·4 in. long, rough above; *palea* narrow, acuminate, membranous, ·5 in. long, 3-nerved on the back, ciliate on the keels. *Lodicules* 0 to 3, often wanting, when present lanceolate, rather blunt, 3- to 5-nerved, shortly ciliate, one much larger than the others. *Stamens* scarcely exserted; *anthers* purple, ·2 to ·3 in. long, cells unequal, roughly apiculate. *Ovary* stalked, hairy, narrowly elliptic, flattened and somewhat triquetrous, gradually narrowed upwards into a long *style*, dividing into 3 minutely hairy *stigmas*. *Caryopsis* obliquely oblong, nearly ·3 in. long, smooth, ending in a long stiff beak. Cephalostachyum schizostachyoides, *Kurz For. Fl'. Burma*, 565. Melocanna? Kurzii, *Munro in Trans. Linn. Soc.* xxvi. 134.

Tropical forests of South Andaman; found by Kurz at Macpherson's Straits.

The genus to which this species belongs had been somewhat in doubt; but the question was set at rest in the 'Genera Plantarum,' in which Bentham and Hooker fil. finally decided it to be a *Bambusa*. It is one of the few bamboos known to grow in the Andaman Islands, and is remarkable for its narrow, acuminate, membranous palea, and long apiculate anthers.

Plate No. 44.—*Bambusa schizostachyoides*, Kurz. 1, leaf-branch; 2, flower-bearing branch—*of natural size;* 3, spikelet; 4, empty glume; 5, flowering glume; 6, palea; 7, lodicules; 8, anther; 9, ovary and stigmas; 10, leaf-sheath—*enlarged.* (All from Kurz' specimens.)

SECTION V.

17. Bambusa Griffithiana, *Munro in Trans. Linn. Soc.* xxvi. 99.

A subscandent, soft bamboo. *Culms* slender, hollow. *Culm-sheaths* not known. *Leaves* large, 1 to 1·5 in. long, 2 to 3 in. broad, lanceolate, acuminate; unequally narrowed at the base into a short ·2 in. thick petiole; ending in a subulate, twisted, scabrous point;

smooth above, except on the scabrous marginal veins, glaucous beneath; scabrous on the edges; main vein thick, prominent, secondary veins 13 to 17, intermediate 5, pellucid glands frequent, giving the appearance of strong transverse veinlets on the under surface; *leaf-sheath* striate, glabrous, keeled, ending in a narrow shining callus, and furnished at the mouth with large crescent-shaped reflexed auricles up to ·7 in long and strongly fringed with long bristles; *ligule* elongate, obtuse or triangular, ciliate, often deeply cleft. *Inflorescence* a terminal panicle with spicate branches bearing distant heads of spikelets; *rachis* soft, hollow, the distance between the heads varying from 1 to 4 in. *Spikelets* cylindrical, ·5 to ·6 in. long, ovate-lanceolate, acute, glabrous, with two empty glumes, one fertile flower and one rudimentary flower on a terminal produced rachilla, the rudimentary flower three times as long as the clavate, glabrous rachilla; *empty glumes* ovate-acute, many-nerved, glabrous; *flowering glumes* similar but larger and mucronate, convolute; *palea* as long, membranaceous, 2-keeled, the keels glabrous, acute, many-nerved, bearing in the deep concavity between the keels the rachilla of the rudimentary flower. *Lodicules* 3, hyaline, long-fimbriate, two ovate obtuse, the third smaller acute. *Stamens* exserted, *anthers* obtuse, bifid at the apex. *Ovary* ovoid, smooth, gradually attenuated into a *style* which is almost at once divided into 3 long plumose *stigmas*. *Caryopsis* not known. DENDROCALAMUS GRIFFITHIANUS, *Kurz For. Fl. Burma* ii. 562. BAMBUSA sp., *Griffith Journ.*, p. 90.

Upper Burma, banks of the Mogaung river, collected by Griffith in September 1837.

This species is characterized by the one-flowered spikelets (like the Perak *B. Wrayi*, Stapf), by the palea having glabrous keels, by the very soft hollow rachis, and by the long-fringed leaf auricles. It has only been once found, but it may be hoped, now that the Mogaung valley is becoming better known, that it may soon be rediscovered. Specimens received from Burma, from the Kyaukshat Forest, Tenasserim, in 1891, by name *Wamyeng* (Burmese), have somewhat similar leaves, but they are more rounded and much longer petioled; then, the rachis is solid, and although the flowers are only in the early bud stage, there is enough to show that they are quite different and have ciliated paleæ. It is not clear why Kurz transferred this species to *Dendrocalamus*. Griffith, in his Journal, p. 90, refers to it as a "*Bambusa*, vaginis collo barbatis."

PLATE No. 45.—*Bambusa Griffithiana*, Munro. 1, leaf-branch; 2 & 3, part of flowering branch—*of natural size;* 4 & 5, spikelet; 6, flowering glume; 7, palea; 8, terminal imperfect flower; 9, lodicules; 10, anther; 11, ovary, and stigmas—*enlarged* (all from Griffith's specimens).

18. BAMBUSA WRAYI, *Stapf in Kew Bulletin*, 1893, 14.

A graceful, semi-scandent bamboo. *Culm* 40 to 60 ft. high, about 1 in. in diameter, very thin, the top curving round almost to the ground; internodes yellow, glabrous, shining, fistular, the third or fourth from the ground very long, sometimes as long as 7 ft. *Culm-sheaths* not described. *Leaves* linear-lanceolate, smooth, 8 to 10 in. long by about 1 in. broad, rounded or attenuate at the base into a narrow, ·1 in. long petiole, above very narrowly acuminate, glabrous on both sides; main vein prominent, secondary veins 7 to 8, intermediate 5 to 7; *leaf-sheaths* pale, striate, glabrous, ending in a shining callus and auricled with a few stiff ciliæ; *ligule* truncate, short, furnished with long (often ·4 to ·5 in.) stiff hairs. *Inflorescence* a large branching panicle bearing leaves, and with the clusters of spikelets collected at the nodes or in short spicate branches; rachis smooth

Spikelets in short spikes subtended by an oblong truncate bract, followed by a small, ciliate, keeled bractlet; then come two imperfect spikelets in the axils of lanceolate, glabrous glumes, the scale at the base of each spikelet 2-keeled, ciliate; then the fertile spikelet; *empty glume* solitary, ovate-lanceolate, acute, glabrous except the ciliæ on the edges, many-veined, convolute; *flowering glume* ovate-lanceolate, acute, glabrous, many-veined; *palea* equal or rather shorter, 2-keeled, rough or faintly ciliate on the keels, bearing between the keels the terminal, ·2 in. long, rachilla which is surmounted by a narrow imperfect flower as long as itself. *Lodicules* narrowly elliptic, ·15 in. long, minutely ciliate. *Stamens* exserted; *anthers* glabrous, blunt. *Ovary* ovate, glabrous, gradually attenuated into a very short *style* which very early divides into 3 long, thin, plumose *stigmas*. *Caryopsis* oblong, ending in a short cylindric beak. *Hooker's Icones Plantarum, Plate* 2253.

Malay Peninsula, in Perak, found by L. Wray, Jun., on the Gunong Inas mountain, at 4,500 to 5,500 feet altitude, near the sources of the Selama and Plus rivers.

The chief characters of this species are the inflorescence (which is more like that of *Melocanna* or *Teinostachyum* than *Bambusa*) and the single fertile flower with rather long lodicules. Dr. Stapf considers it to be closely allied to *B. Griffithiana*, Munro, and to the genus *Nastus*. As he correctly remarks, in appearance it resembles *Melocanna virgata*, Munro, but the structure of the spikelet is different. It is clearly a remarkable species, and may, when the fruit is obtained, be found to belong to another genus than *Bambusa* or possibly to a new one. It has probably the narrowest culm for its length of almost any bamboo known except perhaps *Arundinaria Prainii*. It is called *Buloh versumpitan* in Malay. In a letter to the Director of the Royal Garden, Kew, quoted in the Kew Bulletin, Mr. Wray writes:—"The plant grows at from 4,500 ft. to nearly 6,000 ft. "elevation, generally on the ridges of the hills. The canes are about 1 in. in diameter "near the ground and taper away to $\frac{1}{16}$ in. These long thin ends drop down till "they touch the ground. The canes are from 40 to 60 ft. long. They are furnished "with whorls of leaves at the upper joints, and, as can be imagined, the bamboo is "about the most elegant of its kind ...... The joints are over 7 ft. in length. The "longest joint of a cane is generally the third or fourth from the ground. The "Semangs use the large-sized canes for the outer case of their blowpipes and the small "ones for the inner tube ...... This appears to grow only in two places in Perak."

PLATE No. 46.—*Bambusa Wrayi*, Stapf. 1, flower and leaf-branch—*of natural size*; 2, spikelet; 3, fertile flower with rudimentary terminal flower; 4, bract; 5 & 6, imperfect flower with 2-keeled lower glume; 7 & 8, glumes of imperfect flower; 9, flowering glume; 10, palea of fertile flower; 11, lodicule; 12, ovary and stigmas—*enlarged* (all from Mr. Wray's specimens).

SECTION VI.

19. BAMBUSA BLUMEANA, *Schultes f. Syst. Veg.* vii. 2, 1343 (1830).

A tall thorny bamboo. *Culms* 30 to 60 ft. high or more, about 3 to 4 in. in diameter, hard, smooth, glossy; nodes not prominent; branches many, pale, yellowish, abundantly armed with short recurved spines in threes, the middle one longest; cavity small. *Culm-sheaths* thick, coriaceous, 5 to 6 in. long or more, 3 to 4 in. broad, striate, covered, especially below, with long stiff tawny bristles; slightly attenuate upwards to a broad convex mouth; violet brown and yellow-striped when young; *imperfect blade* nearly as

long as the sheath, triangular, cuspidate, convolute, striate, thickly covered with tawny bristles on both sides, slightly rounded at base and decurrent on the sheath in a narrow band ending in a rounded auricle, the band and auricle lined with a row of stiff long bristles bent in the middle; *ligule* very narrow, dentate, long fimbriate. *Leaves* 5-6 together at the ends of the branchlets, thin, linear-lanceolate, 3 to 6 in. long, ·3 to ·5 in. broad; abruptly rounded at the base into a very short, glabrous petiole; ending above in a twisted scabrous point; glabrous above, glabrous and glaucous beneath; scabrous on the edges; main veins prominent beneath, secondary veins 5 to 7, intermediate 7 to 9; *leaf-sheaths* striate, covered with appressed hairs, keeled, ending in a small, recurved, ciliate callus, and furnished at the mouth with a few, slender, deciduous bristles; *ligule* short, truncate, fimbriate. *Inflorescence* a large branching terminal panicle, bearing spicate branchlets with heads containing many imperfect and few fertile spikelets; rachis smooth, slender. *Spikelets* 1 to 1·5 in. long, compressed, narrow, slender, bearing 2-3 empty glumes, 6 to 8 fertile and 1 to 2 terminal imperfect flowers; *empty glumes* ovate-acute, 3- to 7-nerved, glabrous; *flowering glume* ovate, acuminate, 7-8-nerved; *palea* as long as, or longer than, flowering glume, broad, concave, 2-keeled, ciliate on the keels, blunt. *Lodicules* 3, obovate, long-ciliate, many-nerved, and thickened at the base. *Stamens* little exserted; *anthers* blunt, obtuse. *Ovary* ovate, rounded, glabrous, ending in a short *style*, surmounted by 3 plumose *stigmas*, afterwards stalked. *Caryopsis* obovate, shining above, tipped with the bases of the 3 stigmas. *Kunth Enum.* 431; *Munro in Trans. Linn. Soc.* xxvi. 101; *Kurz in Ind. Forester* i. 340. B. SPINOSA, *Bl. in litt. ad. Nees von Esenb. in Bot. Zeit.* 1825, p. 580. ISCHUROCHLOA SPINOSA, *Büse in Miq. Pl. Jungh*, 389. SCHIZOSTACHYUM DURIE, *Rupr. Bamb.* 46.

Pahang; collected by H. R. Ridley. Also in Java, Sumatra, Borneo and elsewhere in the Moluccas.

This species is easily distinguished from *B. arundinacea* by the long spikelets, different culm-sheaths and fimbriate ligules. The culm-sheaths have the same coriaceous texture and dull colour as those of *B. arundinacea*, but the long-fringed auricles and ligules and bristly back distinguish them. Munro doubts if it is not the same as *B. agrestis*, Poir., but on reading the description of the latter, I am of opinion that it differs, so that I do not quote that species as a synonym. Blume and Kurz give the Malay names of *bamboo durie* and *hower tjutjuk*. The Pahang locality brings it within the region to which this work relates.

PLATE NO. 47.—*Bambusa Blumeana*, Sch. 1, leaf-branch; 2 & 3, flowering branches—*of natural size;* 4, culm-sheath—*reduced;* 5 & 6, spikelets; 7, flower; 8, flowering glume; 9, palea; 10, lodicule; 11, anther; 12 & 13, ovary, style and stigmas—*all enlarged* (from Kurz' Java specimens).

20. BAMBUSA ARUNDINACEA, *Willd. Sp. Pl.* ii. 245 (1799).

A tall, graceful, thorny bamboo with curving branches from a thick central root-stock. *Culms* bright green, shining, variable in length, but in large specimens reaching 80 to 100 ft. high and 6 to 7 in. in diameter, branched from the base, the lower joints giving out long horizontal shoots armed at the nodes with 2 to 3 recurved spines and with few leaves; nodes prominent, lower ones rooting; internodes variable in length, up to 18 in. long, often faintly angular, and in smaller culms flattened on one side, walls thick, 1 to 2 in., cavity small. *Culm-sheaths* coriaceous, orange-yellow when young, often striped

with green and even red, variable in shape and size, but running up to 12 to 15 in. in length and 9 to 12 in. in breadth, striate, somewhat rounded at the top and plaited on the edges, thickly ciliate with golden hairs when young, otherwise glabrous; *imperfect blade* triangular, up to 4 in. long, sharply pointed, concave with involute margins, greenish-yellow when young, glabrous without, densely clothed within with a thick purple or brown or black felt of bristly hairs, the margins decurrent on the sheath, wavy, plaited, long and thickly ciliated, but hardly auricled; *ligule* narrow, entire, or fringed with whitish hairs. *Leaves* linear-lanceolate or linear, very variable in size, up to 7 to 8 in. long and 1 in. broad, rounded at the base into a short, often swollen, ·1 in. petiole; ending above in a sharp stiff point; glabrous above except for long hairs near the base, glabrous or puberulous beneath; scabrous on one or both margins, and ciliate towards the base; main vein narrow, pale, secondary veins 4 to 6, intermediate 7 to 9, transverse veinlets none, but regular pellucid glands at intervals; *leaf-sheath* striate, glabrous or slightly pubescent, ending in a thick, often ciliate, callus and a short auricle furnished with a few stiff, curved, white, deciduous bristles, edges ciliate; *ligule* short. *Inflorescence* an enormous panicle, often formed by a whole culm, branchlets spicate with loose clusters of about 5 pale spikelets; rachis variable, usually stiff, shining, smooth, sometimes dull, striate, occasionally angular and soft, almost fistular. *Spikelets* lanceolate, acute, ·5 to 1 in. long, ·2 in. broad, sessile, glabrous except for the prominent ciliate edges of the palea, consisting of 2, 1 or no empty glumes, then 3 to 7 flowers, the lower ones hermaphrodite, the upper male only, finally one to three imperfect flowers; *empty* and *flowering glumes* ovate-lanceolate, acute or mucronate, many-nerved, glabrous, ·2 to ·3 in. long; *palea* slightly longer, 2-keeled, ciliate on the keels, sub-acute. *Lodicules* three, small, hyaline, ovate, fimbriate on the edges, one usually longer and more acute, 1- to 3-nerved. *Stamens* exserted, drooping, filaments slender; *anthers* yellow, obtuse, sometimes with an apiculate bristle. *Ovary* elliptic-oblong, glabrous except at the tip; *style* short, glabrous, soon dividing into 3 long plumose *stigmas*. *Caryopsis* oblong, ·2 to ·3 in. long, smooth, grooved on one side, ending in a short beak formed by the base of the style, always surrounded by the persistent glume and palea, embryo conspicuous. *Roxb. Corom. Pl.* i. 56, *t.* 79; *Hort. Beng.* 25 (1814); *Fl. Ind.* ii. 191; *Poir. Enc.* viii. 701; *Spreng. Syst. Veg.* ii. 112; *Link Hort. Berol.* i. 249; *Schultes Syst. Veg.* vii. II. 1340; *Kunth Enum.* 431; *Graham Bombay Cat.* 239 (1839); *Dalz. and Gibs. Bomb. Fl.* 299; *Ruprecht Bamb.* 51, *tab.* xiii. *fig.* 50; *Munro in Trans. Linn. Soc.* xxvi. 103; *Brandis For. Flora* 564; *Beddome Flora Sylv.* ccxxxi. *t.* ccxxi.; *Kurz For. Fl. Burma* ii. 554; *Thwaites Enum. Pl. Zeyl.* 375; *Voigt Hort. Sub. Calc.* 719; *Hb. Heyne Wall. Cat.* 5023A. BAMBUSA SPINOSA, *Roxb. Hort. Beng.* 25; *Fl. Ind.* ii. 198; *Buch.-Ham. in Trans. Linn. Soc.* xiii. (1822) 480, *Wall. Cat.* 5024; *Nees in Linn.* ix. (1834) 475; *Spreng. Syst. Veg.* ii. 112; *Rupr. Bamb.* 52 *tab.* xii. *fig.* 52, *tab.* xiii. *fig.* 52; *Munro in Trans. Linn. Soc.* xxvi. 104; *Beddome Flora Sylv.* ccxxxi; *Brandis For. Flora* 566; *Steudel Syn.* 329; *Benth. in Fl. Hongk.* 434; *Voigt Hort. Sub. Calc.* 719. BAMBUSA ORIENTALIS, *Nees in Linn.* ix. (1834) 475; *Rupr. Bamb.* 52, *tab.* xiii. *fig.* 51; *Munro in Trans. Linn. Soc.* xxvi. 105; *Beddome Flora Sylv.* ccxxxi. BAMBUSA ARUNDO, *Hb. Klein ex Nees in Linnæa* ix. 471; *Rupr. Bamb.* 53 *tab.* xiii. *fig.* 53; *Wight ex Steud. Nom.* ed. II. i. 183. BAMBUSA NEESIANA, *Arn. ex Munro in Trans. Linn. Soc.* xxvi. 103. BAMBUSA PUNGENS, *Blanco Fl. Filip.* ed. I. 270. BAMBOS ARUNDINACEA, *Retz Obs.* v. 24 (1789); *Pers. Syn.* i. 393. ARUNDO BAMBOS, *Linn. Sp. Pl.* 81; *Ily, Rheede Hort. Mal.* i. 25, *tab.* xvi.

Throughout India, Burma and Ceylon, except in the Himalaya and Sub-Himalayan region and the valleys of the Ganges and Indus. It is scarce in the Central Provinces,

but occurs not uncommonly in Guzerat. It is very common in both its small and large varieties in Orissa, the Circars and Carnatic. It is common in the Concan and on the Western Ghat Range. In the Deccan it occurs in valleys in the hills as it does throughout South India, ascending in the hill ranges, as in the Nilgiris, to 3,000 ft. and higher occasionally. In Ceylon it occurs in the warmer parts of the island on the margins of rivers and streams (Thwaites). In Lower Assam it is found, but infrequently, in Gauhati and Nowgong, also in Sylhet. It is rather scarce in Eastern Bengal and Chittagong, but becomes more common in Burma, all over Pegu and Martaban down to Tenasserim. It is very largely cultivated everywhere, as in Dehra Dún and in places at the foot of the Punjab Himalaya. It is probably found in its largest size and finest condition in the hills of the Circars, especially about the Godavari, on the hill ranges of the eastern and southern scarps of the Mysore plateau, and in the Nilgiris. The finest clumps I have seen are those in the Rumpa country, north of the river Godavari. Those of Gumsur are also very good. It has been very often collected, especially at the rare seasons of its flowering. It has been introduced into the West Indies.

It will be seen that I have included in this species all the three described by Nees and Roxburgh and acknowledged by Ruprecht, Munro and Beddome, viz., *B. arundinacea*, *B. spinosa*, and *B. orientalis*; also the *B. Arundo* admitted by Ruprecht. I have examined a great series of specimens and can find no real specific difference between them. Munro gives the following as characters for separating the three:—

(1) *B. arundinacea* (including *B. Arundo*).—Rachis very glabrous, shining, hard; spikelets few, long, 6- to 12-flowered; rachilla hirsute, visible; leaves smooth; leaf-sheaths hairy.

(2) *B. spinosa*.—Rachis striate, not shining, hard; spikelets many, shorter, 4- to 6-flowered; rachilla hardly visible; leaves glabrous above, hairy beneath; leaf-sheaths hairy, then sub-glabrous.

(3) *B. orientalis*.—Rachis glaucous green, angled, almost soft; spikelet membranous, 5- to 8-flowered; leaf-sheaths hairy with white ciliæ; petiole hairy.

From these, it appears that *B. arundinacea* and *B. spinosa* differ very little indeed except in the rachis of the panicle and the number of flowers, but the former character is not, I think, constant, and the latter is probably the result of differences in climate and soil; while *B. orientalis* seems more nearly a separate species, and indeed the rachis is remarkable in the specimens I have seen, and justifies its admission as a variety.

Var. *orientalis*—rachis of the panicle green, angled, almost soft; spikelets membranous; leaf sheaths hairy, white ciliate; leaf petiole hairy.

But except these, the characters are by no means constant, and I feel that without better information I am right in thinking that we have in India proper only one thorny *Bambusa*, and that that widely-spread species merely shows, as does the equally universal *Dendrocalamus strictus*, an amount of variation such as is fully accounted for by the variations of climate and soil. Both Brandis and Kurz considered that there was only one species, and I fully agree. Were I to attempt to separate it into varieties, I should make a different division to that adopted by Munro. All the three have practically the same culm-sheath—a character which I believe Kurz, whose knowledge of, and interest in, bamboos was so great, considered to settle the matter.

But if there be some difficulty in recognizing the three varieties which were considered by Munro to be species, it is easy to recognize two very distinct varieties in habit, viz. (1) the tall handsome large-culmed variety of the valleys of the Circars and the hills of South India, and so often cultivated elsewhere; and (2) the almost dwarf, thick-branched, very thorny small-culmed variety which grows gregariously on the low hills and laterite downs of Orissa and Ganjam and extends into Lower Bengal and across to Burma. This latter is gregarious in densely thorny clumps of some 20 feet in height, and is probably the one which Roxburgh meant as *B. spinosa.* But I doubt if it can be described as a variety by any more definite characters.

The thorns on the branches and side shoots; the characteristic culm-sheath with felted hairs inside the imperfect blade, and the narrow pointed leaves characterize this species, which is probably the best known and the most cultivated of all the Indian bamboos. Roxburgh gives as vernacular names: *Bans*, *behor bans* (Bengali), *Mulkas*, *vedru* (Telugu), *Mungil* (Tamil); Dalzell and Gibson give the Bombay name as *Mundgay ;* Brandis gives *Magar bans*, *nál bans* (Punjab), *Kattang* (Central India); Kurz gives *Kyakatwa*, (Burmese); Thwaites *Kattoo-oona-gass* (Cingalese); Van Rheede *Ily* (Malabar). It is also known as *Wahkanteh* (Garo), *Wanah* (Magh), *Kati wadúr* (Gondi), (see the 'Manual of Indian Timbers.') G. Mann has sent me specimens from Sylhet bearing the names *Ketúa*, *kátáúsi* (Bengali), and from Nowgong called *Kotoha* (Assamese). I have also received specimens from the Bombay Presidency bearing names as follows: from A. D. Wilkins from Ahmednagar, *Kalak ;* from R. C. Wroughton from Poona, *Kalki;* from G. P. Millett and L. S. Osmaston from Thana, *Padhai*, *khara*, *manwel*, *goda*, *kashti.* Babu Sree Dhur Chakravarti has sent both the large and the small variety from Khurda, Orissa, under the obvious name of *Kanta bans* (thorny bamboo), probably the commonest name for it in India.

As regards the flowering of this species, Brandis says: "Isolated flowering clumps "are found occasionally, but as a rule all clumps in one flowering district come into "flower simultaneously, a few clumps flowering in the previous and some in the "succeeding year." According to Beddome, this species flowered in 1804, 1836, and 1868 on the Western Coast, and Bourdillon (*Indian Forester*, xiii. 409) says it flowered again in 1882; it flowered gregariously (planted trees only) in Dehra Dún in 1881 (see *Indian Forester*, vol. vi, 336), and previously in 1836 according to Sir W. Sleeman, quoted by Munro. I myself saw it in flower in the Nallamalai Hills of Kurnool in 1889. In Orissa it flowered in 1812; in Canara in 1864; in the Balaghat district, Central Provinces, in 1865, and in Narsingpur in 1885 (G. J. Nicholls in *Pioneer*, April 1893); in Malda in 1874; in Oudh in 1880 (Captain Wood in *Indian Forester*, vii. 59). This year, 1894, it is in flower in Cuddapah (R. McIntosh). Roughly, it may be said to flower about every 30 years, and then to die down, reproducing itself abundantly from seed, and affording a magnificent crop of grain. As the seeds, which somewhat resemble wheat seeds, are edible, they have in some years proved of great value to supplement the food-supply. As regards uses, this bamboo is very largely employed; but it is by no means one of the best kinds, as the culms are rather crooked and often knotty, and the densely interlacing thorny branchlets make it difficult to extract them from the clump. It makes a close, almost impenetrable hedge, and is said to have been largely planted around cities both in North and South India, and specially in Mysore, as a protection against attack. Against such a hedge, nothing

but explosives would be of much effect. Cleghorn, quoting Buchanan's Journal iii. 261, says in respect to this: "In Hyder Ali's time, the town of Bednore, in North-West "Mysore, was defended by a deep trench filled with clumps of this bamboo," and remarks that in 1856 when he visited the place, he found some clumps still remaining (*Forests and Gardens of South India*, p. 207). It is often badly attacked by a small Hemipterous insect recently described as *Oregma bambusæ*, which exudes drops of sticky liquid and blackens the surfaces of the leases.

PLATE No. 48.—*Bambusa arundinacea*, Willd. 1, leaf-branch; 2, part of flower-panicle—*of natural size;* 3, top of young shoot; 4, culm-sheath of lower internode—*reduced;* 5, leaf-sheath; 6, thorns; 7, spikelet; 8, flowering glume; 9, palea; 10, lodicules; 11, anther; 12, ovary, style and stigmas; 13 & 14, caryopsis; 15, the same enveloped in glume and palea; 16, part of rachis of var. *orientalis—enlarged.* (Nos. 3, 4 from Kurz' drawings; No. 16 from Wight's specimen; No. 5 from a fresh Dún specimen; the rest from my own Circar collections.)

SPECIES OF WHICH THE FLOWERS ARE NOT KNOWN.

21. BAMBUSA AURICULATA, *Kurz in Journ. As. Soc. Beng.* xxxix. (1870), 86.

An evergreen, arboreous, tufted bamboo. *Culms* 39 to 50 ft. high, 2 to 2·5 in. in diameter, glossy green, yellow when old, scurfy when young, branches curving downwards; nodes hardly thickened; internodes 18 to 30 in. long, the lower ones shorter, walls thick. *Culm-sheaths* 10 to 12 in. long, 9 to 10 in. broad at base, attenuate upwards, and convexly truncate at 4 in. in breadth, thickly black-ciliate on the margins, the back covered with appressed black or tawny bristles, except for a vacant patch down the middle; *imperfect blade* 6 to 9 in. long, triangular acute from a base about 4 in. broad, which is slightly rounded, and then decurrent on the sheath to form a rounded naked auricle which is green when fresh; striate on both sides, somewhat hairy within, densely appressed-hairy without in two longitudinal streaks which leave the middle line free; *ligule* ·2 in. broad, sharply dentate. *Leaves* lanceolate or linear-lanceolate, 8 to 16 in. long, 1 to 2·5 in. broad, rounded or attenuate at the base into a short ·1 to ·3 in. long petiole; ending above in a long twisted scabrous point; smooth above, except the scabrous points on marginal veins; minutely puberulous beneath when young, afterwards glabrous or roughish, often glaucous; one or both edges scabrous; main veins yellow, shining, prominent, secondary veins 8 to 12, intermediate 6 to 7, pellucid glands between, which give the appearance of transverse veinlets when dry; *leaf-sheaths* smooth, faintly striate, polished, hairy at first, somewhat keeled, ending in a smooth callus, and a small thick rounded glossy naked auricle which is often dark in colour. *Inflorescence*, &c., unknown. GIGANTOCHLOA AURICULATA, *Kurz For. Flora Burma* ii. 557.

Assam, Chittagong and Burma. Collected by Tara Kisor Gupta for G. Mann in Sylhet, by Brandis and Kurz and others in Burma.

This species is included by Munro under *Bambusa vulgaris*, but it is, as correctly pointed out by Kurz, quite distinct, and this is clearly seen by an inspection of the handsome clumps of both species in the Royal Botanic Garden of Calcutta. The round naked auricles of the culm-sheaths and leaves and the peculiar arrangement of the bristles in patches on the sides of the culms-sheaths and of their imperfect blades,

leaving a central line clear, make it easily recognizable. Kurz gives the names *Wu-nel* and *Talagu-wa* (Burmese), Mann gives *Kalia* (Bengali), while other specimens from Burma bear the name *Wanway*. Kurz places it in the genus *Gigantochloa* in his Forest Flora; but in the absence of flowers I prefer to retain it under *Bambusa*, to which it seems to me more properly to belong. It may be hoped that flowers will soon be procurable which will settle its position. It is a handsome species and its culms ought to be useful.

Plate No. 49.—*Bambusa auriculata*, Kurz. 1 & 2, leaf-branches—*of natural size*; 3, culm-sheath—*reduced to about* $\frac{1}{4}$ (from Calcutta Botanic Garden specimens).

22. Bambusa villosula, *Kurz For. Fl. Burma* ii. 553.

An almost simple-stemmed, rarely tufted bamboo, the culms usually arising singly from the stock. *Culms* about 3 in. in diameter; internodes 12 to 15 in. long; nodes hardly raised. *Culm-sheaths* truncate, ciliate on the margins, glabrous outside; *imperfect blade* absent. *Leaves* linear, somewhat cuspidate; 5 to 8 in. long, ·5 to ·8 in. broad; narrowed or rounded at the base into a very short petiole; ending above in a cuspidate, long, twisted, setaceous, scabrous point; scabrous on marginal veins above, otherwise glabrous; glaucescent beneath, hairy near the petiole; edges scabrous; main veins conspicuous, shining, secondary veins 6 to 12, not conspicuous, intermediate 5, pellucid glands which appear in dried specimens as transverse veins; *leaf-sheaths* striate, minutely villous, then glabrescent, whitish-ciliate on the margins, somewhat keeled, ending above in prominent shining calluses, and bearing on one side a large rounded long-fringed auricle; *ligule* short. *Inflorescence*, &c., not known.

Limestone Hills of Martaban and Upper Tenasserim: collected by Brandis in 1862 in the Yônzalin Valley (No. 384).

This is the *Tabendeinwa* (Burmese), *Wami* (Karen) of Kurz; but very little is known about it. It is said to be useful for basket work.

23. Bambusa Mastersii, *Munro in Trans. Linn. Soc.* xxvi. 113.

A climbing bamboo. *Culms* small, reed-like. *Leaves* oblong-lanceolate, 10 to 13 in. long, usually 1·5 in. broad; attenuated at the yellowish base into a glandular (? wrinkled) ·2 in. petiole which is often hairy; rostrate-acuminate at the hairy tip, glabrous on both sides except on the midrib towards the base and the scabrous points on marginal veins, glaucescent beneath; scabrous on the edges; main vein yellowish, shining, secondary veins 10 to 12 pairs, intermediate 5, transverse veinlets formed by pellucid glands oblique; *leaf-sheaths* striate, ciliate on the edges, hairy on the sides with appressed stiff hairs ending in a narrow callus and short auricles bearing several stiff long folded bristles; *ligule* very short.

Assam: collected by Masters at Dibrugarh, No. 1123.

The Assamese name is *Benti bans*. Very little is known of this species.

24. Bambusa marginata, *Munro in Trans. Linn. Soc.* xxvi. 114.

A tall scandent bamboo. *Culms* fistular, glabrous, dark-coloured; branches sub-solitary or fasciculate, deflexed; branchlets bracteate, geniculate, and twisted at the

top, few-leaved; internodes of lower part hirsute above. *Leaves* oblong-lanceolate, 6 to 7 in. long, 1 to 1·2 in. broad, glabrous on both surfaces; rounded at the base into a ·1 to ·3 in. petiole; acuminate above in a setaceous point, the margins near the top shaggy with long, thick, silky hairs; main vein yellowish below, secondary veins 4 to 7 pairs, intermediate 7, transverse veinlets few, oblique, formed by pellucid glands; *leaf-sheaths* striate, keeled, glabrous, ending in a ciliate callus; *ligule* short, truncate, dentate, hairy outside.

Tenasserim: collected by Brandis on the top of the Daunat Range at 5,000 ft. (No. 371).

This may prove to be a *Dinochloa* when better known. It is called *Wamé* (Karen) and climbs among the branches of the oak and chestnut trees. The fringe on the upper margins of the leaves is very remarkable and characteristic.

Species of BAMBUSA *now referred to other genera.*

B. andamanica, Kurz	=	Oxytenanthera nigrociliata, Munro
B. attenuata, Thwaites	=	Teinostachyum attenuatum, Munro.
B. baccifera, Roxb.	=	Melocanna bambusoides, Trin.
B. bifolia, Sieb.	=	Phyllostachys bambusoides, Sieb. and Zucc.
B. bitung, Hassk.	=	Oxytenanthera nigrociliata, Munro.
B. bitung, Roem. and Sch.	=	Dendrocalamus flagellifer, Munro.
B. Brandisii, Munro	=	Dendrocalamus Brandisii, Kurz.
B. calostachya, Kurz	=	Dendrorcalamus calostachyus, Kurz.
B. capitata, Wall. and Griff.	=	Cephalostachyum capitatum, Munro.
B. Falconeri, Munro	=	Dendrocalamus Hamiltonii, Nees and Arn. (in part).
B. Fax, Poiret	=	Melocanna humilis, Roepert.
B. flagellifera, Griffith	=	Dendrocalamus flagellifer, Munro.
B. gigantea, Wall.	=	Dendrocalamus giganteus, Munro.
B. gracilis, Wall.	=	Oxytenanthera nigrociliata, Munro.
B. Helferi, Munro	=	Teinostachyum Helferi, Gamble.
B. longispatha, Kurz	=	Dendrocalamus longispathus, Kurz.
B. macro—, Wall.	=	Arundinaria spathiflora, Trin.
B. M'Clellandii, Munro	=	Dinochloa M'Clellandii, Gamble.
B. maxima, Buch.-Ham.	=	Dendrocalamus Hamiltonii, Nees and Arn.
B. microphylla, Griff.	=	Arundinaria microphylla, Munro.
B. monogyna, Griff.	=	Dendrocalamus Hamiltonii, Nees and Arn.
B. nigrociliata, Büse	=	Oxytenanthera nigrociliata, Munro.
B. pseudarundinacea, Steud.	=	Gigantochloa verticillata, Munro.
B. pubescens, Lodd.	=	Dendrocalamus strictus, Nees.
B. regia, Thoms.	=	Thyrsostachys siamensis, Gamble.
B. reticulata, Rupr.	=	Phyllostachys bambusoides, Sieb. and Zucc.
B. Ritcheyi, Munro	=	Oxytenanthera monostigma, Bedd.
B. scandens, Bl.	=	Dinochloa Tjankorreh, Büse.
B. scriptoria, Dennst.	=	Ochlandra Rheedii, Thw.
B. siamensis, Kurz	=	Thyrsostachys siamensis, Gamble.
B. stricta, Roxb.	=	Dendrocalamus strictus, Nees.
B. Tanæa, Buch.-Ham.	=	Ditto ditto.
B. verticillata, Willd.	=	Gigantochloa verticillata, Munro.
B. verticillata, Rottler	=	Dendrocalamus strictus, Nees.
B. Wightii, Munro	=	Ochlandra Brandisii, Gamble.

4. Thyrsostachys, *genus nov., Gamble.*

Arborescent bamboos of graceful habit and moderate size. *Culms* straight, erect, branching above, often covered with the long persistent sheaths. *Culm-sheaths* elongate, thin; *imperfect blade* long, narrow. *Leaves* usually small to moderate-sized. *Inflorescence* a large compound panicle, the spikelets sessile or stalked in the axils of prominent bracts. *Spikelets* pale-coloured, loose, with 2 to 3 flowers, uppermost seed-bearing, and with a terminal rudimentary flower on a produced rachilla; *empty glumes* 1 or 2, much striate; *flowering glumes* similar; *palea* of lower flowers deeply 2-cleft, with narrow tail-like divisions, 2-keeled, ciliate on the keels, that of upper fertile flower not keeled or cleft, elongate; rachilla hairy. *Lodicules* very thin, 0 to 2 or 3, long acuminate. *Stamens* 6, long exserted, *anthers* mucronate. *Ovary* turbinate, depressed, stalked, surmounted by a long *style*, bearing 2 to 3 broad feathery *stigmas*. *Caryopsis* cylindrical, smooth, glabrous, shining at the top, grooved on one side, long-beaked, embryo prominent, pericarp crustaceous, adherent to the seed.

Flowers large, culm-sheaths straight-truncate at top, leaves moderately large . . . . 1. *T. Oliveri.*
Flowers small, culm-sheaths triangularly-truncate at top and with pointed auricles, leaves small . . . . 2. *T. siamensis.*

1. Thyrsostachys Oliveri, *n. sp. Gamble.*

A large cæspitose bamboo with straight culms from a thick rootstock. *Culms* 50 to 80 ft. high, 2 to 2·5 in. in diameter, bright green with whitish silky down when young, dull green or yellowish when old; nodes very little thickened; internodes 16 to 24 in. long, walls rather thin. *Culm-sheaths* somewhat thin, imbricating at the base, above three-fourths of the length of the internodes, green when young, then turning orange and finally brown, persistent, clothed on the back with thick white stiff pubescence, somewhat rounded at top, but then cut off to a breadth of 1 to 1·2 in., ciliate at the edges, not auricled, though slightly produced; *imperfect blade* long, recurved, subulate, acuminate, hairy above, 8 to 9 in. long by ·7 in. broad; *ligule* ·1 in. broad, serrate. *Leaves* light green, linear-lanceolate, acuminate; 7 to 8 in. long, ·5 to ·7 in. broad, rounded at the base into a short (·1 to ·2 in.) petiole; somewhat rough on both sides, hairy beneath, scabrous on the edges, those of young plants broader, more hairy below and bearing long, bulbous-based, strigose hairs above; main veins narrow, secondary veins 6 pairs, intermediate 5 to 7, no regular transverse veinlets, but frequent irregular pellucid dots instead; *leaf-sheaths* striate, hairy, keeled, ending in glabrous or hairy ciliate calluses and slightly produced at the mouth, ciliate at the edges; *ligule* short, truncate, pubescent. *Inflorescence* a large compound curved thyrsoid panicle bearing bracts at the nodes, with usually one long and two shorter flower-bearing spikelets and one or more sterile ones; rachis flexuose, hairy, swollen at the top; bract a straw-coloured blunt sheath, ·5 to ·7 in. or more long, sometimes with a deciduous green imperfect blade. *Spikelets* ·6 to 1 in., longer ones with long jointed rachis, shorter ones with very short joints; rachis hairy, flexuose; fertile flowers 2 to 3, with an uppermost rudimentary flower on a slender terminal rachilla; *empty glumes* 2, ovate-acute,

·5 in., striate, many-nerved with conspicuous transverse veinlets, sparsely hairy outside, one at the base of the spikelet, the other above; *flowering glume* similar, ·7 to 1 in. long; *palea* of lower flowers longer than flowering glumes, narrow, 2-keeled, ciliate on the keels, 3- to 5-nerved and hairy between the keels, divided often one-fourth of the way down into long hairy tails separated by a sinus, that of the uppermost flower not keeled or ciliate, not, or only slightly, cleft, glabrous except the acute tip, many-nerved and transversely nerved; rachilla hairy. *Lodicules* 2, lanceolate, acuminate, ciliate, very thin. *Stamens* long exserted, drooping, filaments purple, *anthers* yellow, the connective produced in a blunt point. *Ovary* yellow, depressed-turbinate, stalked, surmounted by a long *style*, bearing 3 broad feathery *stigmas*. *Caryopsis* about ·4 in. long, glabrous, cylindrical, with a somewhat broader top, spongy below, ending in a long beak formed by the persistent base of the style; pericarp crustaceous, shining above.

Hills of Upper Burma in moist forests on ridges at 2,000 ft. elevation. A large handsome bamboo of which the stems are greatly in request for building purposes and the seed of which is eaten. It flowered in 1891. Our specimens were collected by Mr. J. W. Oliver, Conservator of Forests, or by Messrs. Allan and Lowis under his orders. It has also been collected by Abdul Huk in the Shan Hills for the Calcutta Royal Botanic Garden. The bracteate, loose inflorescence, deeply-cleft lower paleæ and long entire upper ones at once distinguish this genus of two species, and this species is readily recognized from the other by its larger size in all respects. It is called *Thanawa* in Burmese and *Mai ong* by the Kachins. A considerable quantity of seed has been collected and distributed, and many seedlings have been raised and planted in Dehra-Dun and elsewhere. I have only found two lodicules, but I expect the third is also often present.

PLATE No. 50.—*Thyrsostachys Oliveri*, Gamble. 1, leaf-branch; 2, part of the flowers panicle—*of natural size;* 3, culm-sheath—*reduced* ½; 4, small flowering branchlet of panicle; 5, spikelet; 6, empty glume; 7, flowering glume; 8 & 9, paleæ of lower and uppermost flowers; 10, stamen; 11, lodicule; 12, ovary, with style and stigmas and lodicules; 13 & 14, caryopsis. (All from J. W. Oliver's specimens of 1891.)

2. THYRSOSTACHYS SIAMENSIS, *Gamble.*

A very graceful, cæspitose deciduous bamboo. *Culms* 25 to 40 ft. high, straight, not branching till high up, 1·5 to 3 in. in diameter, usually covered with the persistent old culm-sheaths, otherwise greyish-green; nodes not prominent; internodes 8 to 11 in. long, with a white ring below the nodes. *Culm-sheaths* 9 to 11 in. long, 4·5 to 8 in. broad, soft, thin, covered with fine white appressed pubescence on the back, striate, attenuate upwards to a wavy truncate top, about 1·5 in. broad, produced at the margins into short triangular auricles; *imperfect blade* 4 to 5 in. long, narrowly triangular, the edges recurved; *ligule* narrow, ·1 in. broad, glabrous, finely ciliate. *Leaves* narrow, linear, 3 to 6 in. long, ·3 to ·5 in. broad, rounded or attenuate at the base into a very short (·05 in. long) petiole; points short, twisted; glabrous on both sides, or slightly pubescent beneath when young; scabrous on one edge; main vein narrow, secondary veins 3 to 5, intermediate 6 to 7; *leaf-sheaths* striate, white pubescent and ciliate, truncate, and ending in a glabrous callus; *ligule* very short, ciliate; branches after flowering often producing tufts of wiry branchlets, with very small leaves. *Inflorescence* a large,

graceful, pale panicle, with many thin branchlets, bearing bracteate clusters of few fertile spikelets, which are pedicellate and intermixed with sterile ones; the bract boat-shaped, glabrous, truncate at tip; rachis smooth, very fine, wiry, curved, clavate. *Spikelet* nearly white, bearing 1 empty glume, then 3 flowers, the uppermost of which alone bears fruit, then a narrow produced rachilla, with a minute rudiment of a flower; *empty glume* ·3 to ·4 in. long, ovate-acute, covered at the base with long white pubescence, about 4-nerved on either side; *flowering glume* similar but longer, pubescent below only and at the tip, and about 7-8-nerved on either side; *palea* of lower flowers narrow, 2-keeled, ciliate on the keels, cleft half-way down into narrow ciliate tails, that of uppermost flower not keeled, but bimucronate, concave, striate, glabrous, gradually attenuate into a long beak, longer than the flowering glume. *Lodicules* none. *Stamens* exserted, filaments free, *anthers* pale yellow, narrow, connective produced into a conical purple mucro. *Ovary* at first oval, afterwards depressed, flattened, attenuated suddenly into a narrow glabrous *style*, surmounted by 1 to 3 plumose curved *stigmas*. *Caryopsis* ·2 in. long by ·1 in. broad, cylindric, surmounted by a yellowish, glabrous, soft apex which is produced in a long beak, sulcate on one side, embryo prominent on the other. BAMBUSA SIAMENSIS, *Kurz* MS. BAMBUSA REGIA, *Thomson; Munro in Trans. Linn. Soc.* xxvi. 116.

Burma, from Mandalay down to Tenasserim: collected by Brandis (No. 12) on the Salween river; by J. W. Oliver in Kyaukse and Meiktila districts; Siam, collected by Kurz. Cultivated in the Royal Botanic Garden, Calcutta; and, since its flowering and seeding there in 1892, elsewhere.

Dr. G. King describes this as being one of the most graceful bamboos known. Brandis, quoted by Munro, says: "this is a most elegant bamboo, on account of the "regularity of the nodes," and that it is largely brought to Moulmein and used for umbrella handles. The description of *B. regia*, Thomson, by Munro in *Trans. Linn. Soc.* xxvi. 116, clearly refers to this plant, but the specimens marked by Kurz *B. regia*, T. Thomson, in the Herbarium of the Royal Botanic Garden, Calcutta (Brandis' No. 379 from Yônzalin, 1862; and Kurz' No. 152 from the Karen country), belong to *Dendrocalamus membranaceus*, Munro, and with the doubt whether the name *Bambusa regia*, T. Thomson, really was meant for this species, I prefer to adhere to the specific name *siamensis*. It is easily distinguished from *T. Oliveri* by its much smaller size in almost all respects. Excellent specimens of the leaves and sheaths have been received from J. W. Oliver, Conservator of Forests in Upper Burma, who calls it *Tiyowa* (Burm.)—the "Umbrella-handled bamboo"; and from Mr. Lane-Ryan, Extra Assistant Conservator of Forests, who gives it the same name and also that of *Kyaung-wa*, the latter name meaning 'Monastery bamboo.' It is reported to be commonly cultivated in monastery gardens in nearly all the villages of the Kyaukse and Meiktila districts, and the culms are sometimes used for making the handles of large umbrellas of State for which they are extremely well adapted, being light and strong and straight.

PLATE NO. 51.—*Thyrsostachys siamensis*, Gamble. 1, leaf-branch; 2, flowering branch—*of natural size;* 3, culm-sheath—*reduced;* 4, spikelet; 5, empty glume; 6, flowering glume; 7 & 8, palea of lower flowers; 9 & 10, palea of upper flowers; 11, anther; 12 & 13, ovary, style and stigmas; 14 & 15, caryopsis—*all enlarged.* (All from Royal Botanic Garden, Calcutta, specimens.)

5. Gigantochloa, *Kurz.*

Large arborescent or scandent bamboos. *Culms* usually tall, not branched at the base. *Culm-sheaths* generally stiff, hairy above, smooth below, auricled. *Leaves* rather large, long, usually attenuate at the base. *Inflorescence* a large compound panicle with long spicate branches bearing heads of spikelets. *Spikelets* usually few, often of two kinds, fertile and sterile, oblong or linear; fertile flowers several. *Empty glumes* 2 to 3. *Flowering glumes* similar to empty glumes. *Paleæ* of all flowers 2-keeled, keels ciliate. *Lodicules* 3 or less, often none. *Stamens* 6, filaments joined into a tube which at first is thick and short, and afterwards elongate, membranous. *Ovary* hairy, style elongate, stigmas 1 to 3, hairy. *Caryopsis* usually oblong or narrow, linear, generally furrowed, pericarp membranaceous.

DISTRIB.—The eight species here described are all from Burma and the Malay Peninsula, one only extending northwards to Chittagong and Assam. Besides these eight, there are two more in Java and other islands of the Indian Archipelago, viz. *G. Atter*, Kurz, *G. apus*, Kurz, and *G. robusta*, Kurz. The first is a splendid species and has two varieties—one with green, the other with purple brown culms (var. *nigra*), both of which are growing in the Royal Botanic Garden, Calcutta; the other two species are not at all well known.

Analysis of the species.

Spikelets rounded, oblong.
  Spikelets small, under ·4 in., glabrous . . . . 1. *G. verticillata.*
  Spikelets large, over ·4 in., hairy . . . . 2. *G. Scortechinii.*

Spikelets narrow, acute, cylindrical.
  Leaf ligules short.
    Edges of glumes black-ciliate.
      Spikelets very long, palea ciliate . . . . 3. *G. macrostachya.*
      Spikelets long, palea not ciliate . . . . 4. *G. Wrayi.*
    Edges of glumes pale-ciliate, spikelets long . . . . 5. *G. Kurzii.*
    Edges of glumes not ciliate, glabrous . . . . 6. *G. heterostachya.*
  Leaf ligules long . . . . 7. *G. ligulata.*
Spikelets flattened, large . . . . 8. *G. latispiculata.*

1. GIGANTOCHLOA VERTICILLATA, *Munro in Trans. Linn. Soc.* xxvi, 124.

A very large tufted bamboo. *Culms* 80 to 100 ft. high, 4 to 5 in. in diameter, greyish-green when old, light green striped with narrow thin stripes of yellow when young, mealy at first and bearing closely appressed stiff light brown deciduous hairs; nodes hairy, not prominent; internodes 18 in. long, walls rather thin. *Culm-sheaths* large, crisp, 12 in. long by as much or more in breadth, rounded gradually to a mouth 1 to 1·5 in. broad bearing on either side small rounded auricles fringed with a few stiff ciliæ, produced at the margins beyond the auricles to meet the ligule; inner surface shining, glabrous, outer densely covered with golden brown stiff hairs; *imperfect blade* short, ovate, acuminate, hairy within, recurved, slightly decurrent in a narrow edge

to the top of the sheath; *ligule* narrow, shortly fimbriate or loy dentate. *Leaves* oblong-anceolate, 10 to 15 in. long, 1·5 to 2·5 in. broad; narrowly attenuate at base with a ·2 to ·3 in. petiole; ending in a subulate, setaceous, twisted, scabrous tip; glabrous above, hairy beneath when young, afterwards glabrous; scabrous on the margins; main vein narrow, pale beneath, secondary veins 8 to 12, intermediate 7 to 8; *leaf-sheaths* hairy when young, somewhat keeled, striate, truncate at top and ending in a narrow callus and short, glabrous, rounded auricle, the margin produced to meet the *ligule* which is about ·1 in. long. *Inflorescence* a compound panicle of spicate branchlets bearing distant heads of few small spikelets; rachis smooth, slender, nearly solid. *Spikelets* ovate, sub-acute, ·3 to ·4 in. long with 2 to 4 fertile flowers; *empty glumes* 2 to 3, broadly ovate-acute, minutely ciliate on the edges; *flowering glume* similar, many-veined, shortly mucronate, ciliate on the edges; *palea* shorter than flowering glume, oblong, 2-keeled, ciliate on the keels and between them, sometimes bimucronate, 3—5-nerved. *Lodicules* variable, usually 3 only in the uppermost fertile flower, 1 to 2 in the others, oblanceolate, fimbriate. *Stamens* exserted, tube membranous, *anthers* yellow, ending in a more or less hairy point. *Ovary* sub-orbicular, very hairy; *style* narrow, rather short, pubescent, dividing into 2 to 3 white *stigmas*. GIGANTOCHLOA MAXIMA, *Kurz in Tijdschr. Nederl. Ind.* xxvii (1864) 226; *Ind. Forester* i. 343. BAMBUSA VERTICILLATA, *Willd. Spec. Pl.* ii. 245 (1797). BAMBUSA PSEUDARUNDINACEA, *Steudel Syn.* 330.

Wild, or more usually cultivated, in the Malay Peninsula, and throughout the Malay Archipelago, probably extending northwards to Tenasserim; cultivated in the Calcutta Botanic Garden.

A species very striking from its light-coloured striped culms. The sheaths somewhat resemble both those of *Gigantochloa Atter* and *Dendrocalamus giganteus.* Kurz gives the Malay names *Bamboo andong*, *bamboo gombong*, *bamboo dyawa*, also *awie soorat* (Sunda). Ridley's specimen No. 119 collected at Twali, Singapore, and identified by Hackel, is said to be the *Campong* bamboo.

PLATE No. 52.—*Gigantochloa verticiliata,* Munro. No. 1, leaf branch; 2, flower branch—*of natural size;* 3—top of culm-sheath,—*much reduced;* 4—part of young shoot, *reduced;* 5 & 6, spikelet; 7, flowering glume; 8, palea; 9, staminal tube and anthers; 10 lodicules and anthers; 11, ovary, style and stigmas; 12, leaf-sheath—*enlarged.* (Nos. 6, 7, 8, 10, 11, from Kurz' specimens; No. 1 from specimens collected in Royal Botanic Garden, Calcutta; rest from Kurz' drawings in the Herbarium of that Institution.)

2. GIGANTOCHLOA SCORTECHINII, *n. sp. Gamble.*

A tall gregarious bamboo. *Culms* 40 to 80 feet high, 4 to 6 in. in diameter. *Culm-sheaths* not known. *Leaves* 12 to 16 in. long, 1 to 1·5 in. broad, linear-lanceolate, often unequal sided; narrowly attenuate at the base into a ·2 to ·3 in. petiole, acuminate, the tip with a twisted scabrous point; smooth above, softly hairy pubescent beneath; scabrous on the edges; main vein rather narrow, secondary veins 8 to 10, intermediate 7 to 8, transverse veinlets conspicuous, formed by pellucid glands joined obliquely to the veins on either side; *leaf-sheaths* densely pubescent, ending above in a pubescent callus and a small rounded auricle fringed with a few stiff short bristles, ciliate on the edges; *ligule* short, hairy. *Inflorescence* a large compound panicle of curved spicate branchlets bearing verticils of distichous heads, each head bearing 2 to 5 large fertile

mixed with few small sterile spikelets; *rachis* pubescent, sinuate, sometimes flattened on one side, 1 to 2 in. between the heads. *Spikelets* of three kinds, large ones bearing fertile flowers, medium-sized bearing merely glumes without paleæ or with only rudimentary paleæ, and small sterile ones; fertile spikelets ·7 to ·9 in. long, ·3 to ·4 in. broad, flattened, ovate-acute, densely silvery grey pubescent, bearing 2 to 3 empty glumes, then 3 to 5 fertile flowers, then one imperfect terminal flower; *empty glumes* ovate, mucronate, densely pubescent; *flowering glume* similar but longer, that of uppermost fertile flower convolute; *palea* shorter than flowering glume, 2-keeled, ciliate on the keels, 6-nerved between them, bifid at apex, uppermost one less ciliate. *Lodicules* none. *Stamens* exserted, tube thick at first, afterwards elongate, membranous but persistent, *anthers* light yellow, narrow, long apiculate. *Ovary* rounded, hairy above, *style* long, glabrous, ending in a bifid white hairy *stigma*. *Caryopsis* glabrous, ellipsoid, ending in an obtuse, hairy truncate top and surmounted by the short persistent base of the style.

Malay Peninsula, collected by the late Rev. Father Scortechini, also by H. Kunstler, Dr. King's collector, at Ulu Kerling and Ulu Selangore in 1886 (No. 8572), also by L. Wray, Junior, in Upper Perak (No. 3433) in 1889.

This must be a fine species. It is said to be gregarious, forming whole forests on flats and on the sides of hills at 400 to 600 ft. elevation. Wray gives the Malay name as '*Bulu Rayah*.' I am very glad to be able to dedicate his beautiful discovery to the late Father Scortechini, whose admirable work and boundless energy have done so much to make known the flora of the Malay Peninsula.

PLATE No. 53.—*Gigantochloa Scortechinii*, Gamble. No. 1, leaf branch; No. 2, part of flower panicle,—*of natural size;* 3, spikelet; 4, empty glume; 5, palea and staminal tube with stigmas; 6, the same elongated; 7, terminal imperfect flower; 8, ovary, style and stigmas; 9, caryopsis (unripe); 10, leaf sheath—*enlarged*. (From Father Scortechini's specimens.)

3. GIGANTOCHLOA MACROSTACHYA, *Kurz For. Fl. Burma* ii. 557.

A large evergreen bamboo. *Culms* 30 to 50 ft. long, dark green when old, glaucous when young, especially below the nodes, sometimes striped, 2·5 to 4 in. in diameter, fistulose, the walls being ·2 to ·3 in. thick; nodes scarcely thickened, hairy; internodes 16 to 30 in long, lower ones shorter. *Culm-sheaths* rather short, 5 to 8 in. long, up to 14 in. broad, not much narrowed upwards to the truncate top, densely covered with appressed blackish deciduous hairs, subciliate at the edges; *imperfect blade* as long as or shorter than the sheath, reniform, acute, appressed-hairy beneath, less so above, rounded at the base, and then again produced into a broad (·5 to 1 in.), wavy, long-fringed band ending in rounded auricles, sometimes somewhat decurrent; *ligule* narrow, entire or faintly toothed. *Leaves* thin, lanceolate, 6 to 15 in. long by ·5 to 2 in. broad, attenuate or rounded at the base into a short, 1 in. long, often wrinkled petiole; produced above into a setaceous scabrous point; glabrous above except the scabrous points on the marginal nerves, whitish and minutely and softly puberulous beneath; scabrous on the margins; main vein rather narrow, secondary veins 5 to 13, intermediate 7; *leaf-sheath* hairy at first, afterwards nearly glabrous, somewhat keeled, ending in a rounded callus and having on one or both sides a small glabrous rounded auricle which is fringed with few very deciduous long ciliæ; in young specimens the auricle is much longer and more

ciliate; *ligule* short. *Inflorescence* a huge leafy panicle, the leaves early deciduous, bearing spicate branchlets with heads of spikelets, many together, both very long fertile and short sterile ones; rachis striate, heads 1·5 to ·3 in. apart, up to 3 in. in diameter. *Spikelets* 1 to 2 in. long, ·1 in. broad, linear, sharply subulate, acuminate, usually straight, marked by the conspicuous black fringes to the glumes; fertile flowers 2 to 3; terminal flower incomplete or reduced to a subulate produced rachilla; *empty glumes* 2 to 3, ovate, mucronate, ·3 to ·6 in. long, black-fringed on the edge, and with few appressed black stiff hairs on the many-nerved back; *flowering glume* similar but longer and longer mucronate, linear-lanceolate, convolute; *palea* very narrow, narrowest at the base, ·7 to 1 in. long, 2-keeled, white-ciliate on the keels, minutely bifid at the apex, 3-to 5-nerved on the back. *Lodicules* none. *Stamens* exserted, the tube at first short, thick, afterwards produced and thin, membranous; *anthers* purple, ·4 to ·6 in. long, each ending in a fine setaceous hairy point. *Ovary* narrowly ellipsoid, rounded above and surmounted by a long fine curved hairy *style* with undivided *stigma*. *Caryopsis* narrow, linear, rounded above and minutely pubescent, tipped with the persistent style.

Assam, Chittagong and Burma, chiefly in tropical forests, often cultivated. Collected by Brandis in the Sittang Hills in 1862 (flowers), and in the Karen Hills in 1880; by Kurz in Pegu and Martaban and at Boronga Island in Arracan in 1869, 1871; by J. W. Oliver in the Kachin Hills, 1893; by W. Schlich, and by myself (1879) in Chittagong; and by G. Mann in the Garo Hills of Assam in 1889.

This handsome bamboo is difficult to distinguish from several other species unless it is found in flower. Its leaves resemble those of *Bambusa Tulda;* its sheaths those of *B. nutans* and *B. teres;* and even the spikelets are like those of *Oxytenanthera nigrociliata* in their black fringes and narrow shape, though they differ by being much longer and in having the terminal palea keeled. It is known in the Garo Hills by the name *Tekserah;* in Chittagong as *Madi* or *Madaywa;* in Burma under the names of *Wanet*, *wapyugyi*, *tabendeinwa* (Burmese); *Wabray* (Karen). It is cultivated in the Calcutta Botanic Garden and is a handsome kind.

PLATE No. 54.—*Gigantochloa macrostachya*, Kurz. No. 1, leaf branch; 2 & 3, flowering branches—*of natural size;* 4 & 5, culm-sheaths—*reduced to* ¼ *or more;* 6 & 7, spikelet; 8 & 9, empty glumes; 10, flowering glume; 11 & 12, palea, the former showing also the imperfect terminal flower; 13, staminal tube, anthers and style; 14, apex of anthers; 15, caryopsis (young)—*enlarged.* (No. 4 from Kurz' specimen, No. 5 from his drawing in the Calcutta Botanic Garden Herbarium, the rest from Brandis' specimens).

4. GIGANTOCHLOA WRAYI, *n. sp. Gamble.*

Culms about 3 in. in diameter, branchlets smooth, clothed with glaucous scurf. *Leaves* 12 to 15 in. long, 2 to 2·5 in. broad, oblong-lanceolate, cuspidate, acuminate, somewhat roundly attenuate at the base into a ·2 to ·3 in. broad petiole; ending above in a subulate, scabrous, setaceous point; smooth above, except the scabrous points on the marginal veins, pale and softly strigosely hairy beneath, scabrous on the edges; main vein broad, yellow, secondary veins 10 to 12 pairs, intermediate 7, faint transverse veinlets formed by pellucid glands; *leaf-sheaths* smooth, keeled, ending in a narrow callus below the petiole and furnished at the mouth with a short auricle which is, as well as the top of the sheath, fringed with long stiff white bristles; *ligule*

short, minutely pubescent. *Inflorescence* a large compound panicle of spicate branches bearing heads of spikelets; heads with few fertile flowers, several sterile flowers and many short bracts; rachis slender, somewhat grooved, minutely pubescent, joints somewhat curved from 2 in. down to ·5 in. in length. *Spikelets* conical, somewhat flattened, ·7 to ·8 in. long, ·2 in. broad, acute, bearing 2 to 3 empty glumes and 3 to 4 fertile flowers; *empty glumes* oval, mucronate, striate, fringed with stiff blackish-brown hairs; *flowering glumes* similar but longer, and longer mucronate; *palea* narrow, oblanceolate, bifid at apex, 2-keeled, keels not or only very faintly ciliate, 5- to 7-nerved. *Lodicules* none. *Stamens* exserted, tube thick at first, afterwards long membranous; *anthers* very long, narrow, ending in a long hairy setaceous point. *Ovary* narrowly ovate, hairy, surmounted by a long, very slender, pubescent *style* and a broadly plumose *stigma*. *Caryopsis* not known.

Malaya: collected at Bakit Gantang, Perak, by L. Wray, Jr., in May 1888.

This species, which ought to be a fine one, but of which no information is available except that it grows in the plains and has culms 3 in. in diameter, is known as *Bulu Plang*. The long ciliæ of the leaf-sheath and the almost complete absence of ciliæ to the palea are its chief characteristics.

PLATE No. 55.—*Gigantochloa Wrayi*, Gamble. 1, leaf-branch; 2, part of flower-panicle —*of natural size*; 3, spikelet; 4, empty glume; 5, palea; 6, staminal tube and stigma; 7, anther point; 8, ovary, style and stigma—*enlarged*. (All from Wray's specimens.)

5. GIGANTOCHLOA KURZII, *n. sp. Gamble.*

Habit and *culms* not known. *Culm-sheaths* glabrous, cylindrical, about 6 in. long by 3 in. broad, truncate at top; *imperfect blade* longer than sheath, recurved, lanceolate, acuminate, decurrent in a narrow, black, glabrous band lining the top of the sheath and ending in a small, round, naked auricle; *ligule* narrow. *Leaves* linear-lanceolate, 8 to 13 in. long, ·5 to 1·5 in. broad, attenuate at the base into a ·2 in. long petiole; glabrous above, except the scattered scabrous points on marginal nerves, whitish and with scattered hairs beneath, scabrous on the edges; main vein narrow, secondary veins 9 to 11, intermediate 7 to 8; *leaf-sheaths* appressed-hairy when young, then smooth, truncate above and furnished with small rounded auricles; *ligule* short. *Inflorescence* a leafy panicle of spicate branchlets bearing distant heads of 2 to 3 spikelets in the axil of a smooth narrow bract; rachis slender, striate. *Spikelets* ·4 to ·5 in. long, acute, conspicuously fringed on the edges of the glumes; *empty glumes* 2 to 3, ovate, mucronate, thickly brown-ciliate on the sides and edges, many-nerved; fertile flowers 2 to 3; *flowering glumes* similar to empty glumes but longer, narrower, and with a longer mucro; *palea* linear, blunt, 2-keeled, ciliate on the keels, 3- to 5-veined; terminal flower incomplete. *Lodicules* not found. *Stamens* with tube short, thick; *anthers* about ·2 in. long, blunt, apiculate; *ovary* elongate, stalked, minutely hairy, ending in a long simple *style*, with a plumose *stigma*. *Caryopsis* (young) oblong, truncate above, pointed below, glabrous.

Coasts of Southern Burma and the Malay Peninsula: collected in Tenasserim by Kurz on his last voyage in January-February 1878 under the name of *Kobah;* also in Perak in 1892 by H. N. Ridley (No. 3114) under the name *Bulu akar* (Malay) and by L. Wray, Jr., at Thaipang, Perak, under the name *Bulu mata kusa* or 'deer's eye bamboo.'

PLATE No. 56.—*Gigantochloa Kurzii*, Gamble. 1 and 2, flower- and leaf-bearing branchlets—*of natural size;* 3, culm-sheath—*reduced;* 4, spikelet; 5 and 6 empty glumes; 7, palea; 8, staminal tube, anthers and style; 9 and 10, ovary and style; 11, do. (older) with stamens—*enlarged.* (Nos. 10 and 11 from Wray's; the rest from Kurz specimens.)

6. GIGANTOCHLOA HETEROSTACHYA, *Munro in Trans. Linn. Soc.* xxvi. 125.

A graceful, apparently somewhat scandent, bamboo. *Culms* 30 ft. long, thin-walled. *Culm-sheaths* not known. *Leaves* linear-lanceolate, 4 to 11 in. long, ·5 to 1 in. broad, rounded at the base into a short petiole about ·1 in. long, produced above into a long, scabrous, twisted, setaceous point; smooth above, except the scabrous points on the marginal veins, smooth below except for a few hairs on the midrib, scabrous on the margins; main vein narrow, shining, secondary veins 6 to 8, intermediate 5 to 7; *leaf-sheaths* striate, ending at the mouth in a shining callus and a rounded glabrous auricle, and produced beyond it to meet the ligule; *ligule* long, dentate, glabrous, sometimes long ciliate. *Inflorescence* a large leafy panicle with spicate branches bearing distant few- rarely many-flowered heads in the axils of chaffy glabrous bracts; heads with fertile flowers often with only one spikelet, those with sterile flowers bearing 4 to 5; rachis smooth, striate, uppermost joints slightly pubescent, distance between heads from ·5 up to 4 in. or more. *Spikelets* of two kinds: sterile ·5 to ·7 in., consisting of glumes sheathed one within the other; fertile 1 to 1·3 in. long, ·2 in. broad, glabrous, oblong, compressed, with usually 1 to 3 empty glumes or with one incomplete flower, 4 to 5 fertile flowers and 2 to 3 terminal incomplete flowers, all on the joints of a persistent rachilla; *empty glumes* ovate, acute or mucronate, many-nerved, glabrous; *flowering glumes* similar, but those of upper flowers convolute, longer mucronate; *palea* shorter than flowering glume, that of lowest (usually imperfect) flower very short, obtuse, 2-keeled, ciliate on the keels, 4- to 8-nerved. *Lodicules* 2 to 3, oblong or ovate, blunt or somewhat acute, long-fimbriate. *Stamens* exserted, tube short and thick at first; *anthers* about ·4 in. long, apiculate, the point penicillate. *Ovary* ellipsoid, very hairy, with a hairy *style* somewhat flattened and often curved, and bearing one to three plumose purple *stigmas*. *Kurz in Indian Forester* i. 345.

Malay Peninsula, collected by Griffith (No. 6731) near Ayer Punas, about houses.

The few fertile spikelets, which are glabrous and many-flowered, seem to distinguish this species. Kurz thinks it must be a *Teinostachyum*, but the spikelets I have examined are distinctly those of a *Gigantochloa*, with monadelphous stamens, keeled paleæ and lodicules. Munro says there are three lodicules, but I have only found two, so too I have only found undivided stigmas. With this also I identify Ridley's No. 1717, *Bulu tilan*, with much larger and many-flowered heads. The plate was done from Griffith's specimen, and does not show the head quite so large or with so many spikelets as it should perhaps do. *G. latispiculata* with much-flattened large spikelets in heads of 2 to 3 only comes very near this.

PLATE No. 57.—*Gigantochloa heterostachya*, Munro. 1, leaf- and flower-bearing branch —*of natural size;* 2, leaf-sheath; 3, spikelets; 4 & 5, empty glumes; 6 & 7, flowering glume and palea of lowest flower; 8 & 9, flowering glume, palea and anthers of uppermost fertile flower; 10, palea; 11, lodicules; 12, staminal tube and atnhers; 13, anther tip; 14, jointed rachilla with terminal imperfect flowers—*enlarged*

(all from Griffith's specimen, No. 3 four times enlarged); 15, ovary with stigmas (from Ridley's specimen).

7. GIGANTOCHLOA LIGULATA, *n. sp. Gamble.*

Culms and *culm-sheaths* not known. *Leaves* 12 to 16 in. long, 2 to 3 in. broad, oblong-lanceolate, unequal at the base and unequally attenuate into and decurrent into a ·2 to ·3 in. long, flat petiole, wrinkled at base; acuminate above in a scabrous point with reflexed edges; smooth above, except the scabrous points on the marginal veins, pale beneath and smooth, except the scabrous tip; scabrous on one margin; main vein broad, yellow beneath, secondary veins 12 to 14 pairs, intermediate 6 to 7, pellucid glands many, giving the appearance of transverse veinlets beneath, these being very conspicuous when young; *leaf-sheaths* smooth, shining, brown, striate, ending in a cushion-like, shining, rounded, often ciliate callus and produced at the mouth to meet the ligule; *ligule* up to 1 in. long, glabrous, bifid in two long, acuminate, membranous lobes. *Inflorescence* a long terminal panicle of spicate branchlets bearing distant heads on leafy branches; *heads* with 5 to 8 fertile spikelets, in the axils of long, yellow, stramineous bracts; *bracts* glabrous, ·5 to 1·5 in. long, ending in a truncate mouth which is furnished with round, dark, naked auricles and long-fimbriate ligules; *rachis* fistular, glaucous, smooth in the lower half, minutely pubescent with white hairs in the upper, lower joints 3 in. long, gradually decreasing to about ·5 in. at the summit. *Spikelets* ·6 to ·8 in. long, conical, acuminate, with 2 to 4 empty glumes, 3 to 4 fertile flowers and 1 terminal imperfect flower; *empty glumes* ovate, acute, mucronate, many-veined, long brown ciliate on the margins; *flowering glume* similar but longer and more mucronate; *palea* shorter than flowering glume, 2-keeled, long ciliate on the keels, blunt or bi-mucronate, 5-nerved on the back. *Lodicules* none. *Stamens* exserted, tube thickened at first, afterwards membranous; *anthers* long, narrow, apiculate, hairy at tip. *Ovary* depressed, ovate, shining, hairy, long-stalked, ending in a slender *style* and short plumose *stigma*. *Caryopsis* not known.

Malaya: collected at Kuala Wok in Perak by L. Wray, Jr., (No 845) and by H. N. Ridley at Kwala Pahan in Pahang in 1891 (No. 5597). This must be a splendid bamboo, judging from the specimens of the leaves and inflorescence. It is called *Buluh telor*, and in many respects resembles *G. Kurzii*, but differs notably in the much larger leaves and longer spikelets, the long ligules, and the hairy rachis.

PLATE No. 58.—*Gigantochloa ligulata*, Gamble. 1, part of leaf branch; 2, part of flower branch—*all of natural size;* 3, spikelet; 4, empty glume; 5, flowering glume; 6, palea; 7, staminal tube and anthers; 8 & 9, ovary with style and stigma—*enlarged* (from L. Wray's specimens).

8. GIGANTOCHLOA LATISPICULATA, *n. sp. Gamble.*

A large bamboo. *Culms* about 50 ft. high. *Culm-sheaths* not known. *Leaves* pale, 12 to 14 in. long, 1 to 1·4 in. broad, lanceolate, attenuate at the base and decurrent into a ·2 to ·3 in. long petiole; glabrous on both sides, smooth, except the scabrous points on marginal veins; main vein shining, prominent, secondary veins 8 to 9 pairs very inconspicuous, intermediate 6 to 7; *leaf-sheaths* smooth, glabrous, keeled, ending in a

narrow callus and produced beyond the base of the petiole to meet the ligule; *ligule* broad, cleft. *Inflorescence* a terminal panicle of spicate branchlets, bearing distant heads with a few very large flattened spikelets; heads 1 to 3 in. apart with 1 to 4 spikelets and very small bracts, rachis smooth, striate. *Spikelets* 1·2 in. long, ·3 to ·4 in. broad, compressed; *empty glumes* 2 to 3, lower with a separate imperfect blade, ovate-lanceolate, mucronate, many-veined, glabrous; *flowers* about 7 to 9 with 1 or 2 terminal imperfect ones; *flowering glume* ovate-lanceolate, long-acuminate, slightly ciliate on the edges and hairy within; *palea* shorter than flowering glume, 2-keeled, 7-nerved, ciliate on the keels, blunt. *Lodicules* small, obovate, 3—5-nerved, fimbriately ciliate. *Stamens* exserted, tube thickened at first, afterwards very fragile, membranous; *anthers* narrow, penicillate apiculate. *Ovary* narrowly ovoid, pubescent, narrowed into a slender *style* which is divided above into 3 plumose *stigmas*.

Malaya: collected by Mr. Alwis, in Malacca, in 1886 for the Singapore Botanic Garden.

This has more the appearance of *Bambusa* than of *Gigantochloa*, but the monadelphous stamens are conclusive. It comes very near to *G. heterostachya*, but the spikelets are larger and compressed. It is said to be used for basket-making and to be called *Bulu tilán miniak*. It is at once recognised by the very large flattened spikelets.

Plate No. 59.—*Gigantochloa latispiculata*, Gamble. 1, leaf-branch; 2, flowering branch —*of natural size;* 3, spikelet; 4, empty glume; 5, flowering glume; 6, palea; 7, lodicule; 8, staminal tube and anthers; 9, anthers; 10, ovary with style and stigmas; 11, leaf sheath—*enlarged.* (All from the Malacca specimen.)

6. Oxytenanthera, *Munro.*

Arborescent or scandent bamboos, usually of medium or small size, unarmed, often gregarious. *Culms* from a thick rhizome, usually creeping underground and stoloniferous; *culm-sheaths* various, usually rather narrow, the imperfect blade also narrow. *Leaves* variable, but generally small, shortly petiolate, as in *Bambusa*. *Inflorescence* a large panicle with spicate heads of few or many spikelets. *Spikelets* narrow, elongate, conical, bearing 1, 2 or 3 flowers, the uppermost usually fertile. *Empty glumes* 1 to 3, *flowering glumes* ovate, elongated, mucronate. *Palea* of lower flowers 2-keeled, of uppermost flower convolute, only little or not at all keeled. *Lodicules* none. *Stamens* monadelphous, exserted, tube thickened at first, afterwards membranaceous, elongate; *anthers* narrow, acute or apiculate. *Ovary* ovoid, *style* fine, *stigmas* 1 to 3, usually more or less plumose. *Caryopsis* elongate, terminated by a beak formed by the persistent style base, grooved, embryo conspicuous.

Distrib.—Nine species, eight herein described and one (*O. abyssinica*, Munro) of Tropical Africa.

Analysis of the species.

Heads usually few-flowered (Burmese and Malay species).

Edges of glumes ciliate.

Ciliæ of glumes black or purple . . . . 1. *O. nigrociliata.*

„ „ white, spikelets glabrous . . . . . 2. *O. albociliata.*

„ „ pale, spikelets pubescent, many . . 3. *O. sinuata.*

Edges of glumes not ciliate . . . . 4. *O. parvifolia.*

Heads many-flowered (South Indian species).

Spikelets 1-flowered.

Style hairy . . . . 5. *O. Thwaitesii.*

„ glabrous . . . . 6. *O. monostigma.*

Spikelets 2-flowered . . . . 7. *O. Stocksii.*

„ 3-flowered . . . . 8. *O. Bourdilloni.*

1. OXYTENANTHERA NIGROCILIATA, *Munro in Trans. Linn. Soc.* xxvi. 128.

An evergreen tufted bamboo. *Culms* 30 to 40 ft. high, ·5 to 2 in. in diameter, usually dark green, sometimes marked with longitudinal yellow stripes; nodes prominent; internodes scabrous, rough above. *Culm-sheaths* about 6 in. long, striate, ciliate at the edges, covered on the back with appressed stiff brown hairs, slightly narrowed upwards, truncate at the top; *imperfect blade* ovate-lanceolate, decurrent on the sheath, and furnished on either side with a bright green, rounded, naked auricle, hairy within; *ligule* narrow, faintly toothed. *Leaves* 6 to 12 in. or more long, 1 to 2 in. broad, lanceolate; unequally rounded at the base or attenuate into a ·2 to ·3 in. petiole; ending above in a subulate twisted point; somewhat rough above, pale and smooth and at first pubescent beneath, scabrous on one margin; main vein prominent, secondary veins 9 to 12, inconspicuous, transverse veinlets none, but pellucid glands which appear beneath like transverse veinlets; *leaf-sheaths* stiff, hairy at first, afterwards smooth, ciliate at the edges, produced at the mouth and furnished with small, naked, rounded auricles; *ligule* narrow. *Inflorescence* a large compressed, sometimes leafy, panicle of spicate verticils; rachis pubescent especially above, striate, 1 to 3 in. between verticils; spikelets usually few in the verticils. *Spikelets* narrow, cylindric, 1 in. long by ·1 to ·2 in. in diameter, conspicuously black- or purple-fringed at the edges of the glumes, sometimes curved; bearing empty glumes 2 to 3, fertile flowers 2 to 3, and a terminal imperfect flower; *empty glumes* ovate-acute, mucronate, ciliate on the edges, many-veined; *flowering glume* lanceolate, acuminate, long-mucronate, ciliate on the upper margins, many-veined; *palea* shorter than, or as long as, the flowering glume, narrow, obtuse or acute or bimucronate, 2-keeled, ciliate on the keels and 2- to 3-veined between them, that of uppermost flower convex, glabrous. *Stamens* exserted, tube at first thick, afterwards elongated, membranous; *anthers* ·3 to ·4 in. long, narrow, purple, ending in a long hirsute point. *Ovary* narrowly ovoid, acuminate, pubescent, *style* slender, *stigmas* 1—3, plumose, short. *Caryopsis* linear-oblong, ·6 in. long, ·1 in. broad, glabrous, truncate at the top and with a short penicillate beak, grooved on the back, embryo conspicuous. *Beddome Fl. Sylv.* ccxxxiii. BAMBUSA NIGROCILIATA, *Büse in Pl. Jungh.* i. 389; *Miquel Flora Ind. Bat.*, vol. III, 416; *Walpers Ann.* iv. 1045. BAMBUSA BITUNG, *Hassk. Pl. Jav. Rar.* 42. BAMBUSA GRACILIS, *Wall. Cat.* 5033. GIGANTOCHLOA NIGROCILIATA, *Kurz Ind. Forester* i. 345. G. ANDAMANICA, *Kurz For. Fl. Burma* ii. 556.

Orissa, Chittagong, Burma, Andaman Islands, Malay Peninsula, extending to Sumatra and Java. Said also to occur in Coorg and Canara, but this requires further investigation: the specimens were collected by Hohenacker and by no one else. Collected by Helfer in Tenasserim; also by Falconer in 1849; also by G. King on Pagoda Hill, Moulmein, in 1879; by Kurz in S. Andaman, and by A. L. Home in the Andamans in 1875; by myself in Kasalong valley, Chittagong (not in flower), in 1880.

The black-fringed spikelets and naked auricles of the culm-sheaths distinguish this species. Kurz says it is called *Bamboo lengka* in Malay, and that it is gregarious in the Andamans. To this species also I attribute the specimens sent by G. Mann from the Garo Hills, Assam, in 1889, under the name *Washut* (Garo), though the culm-sheaths and their imperfect blades are longer; also the specimen sent from Khorda, Orissa, by Babu Sree Dhur Chakravarti under the name *Bolangi bans*. Mann says that *Washut* is used in hut building and for basket work.

PLATE No. 60.—*Oxytenanthera nigrociliata*, Munro. 1, leaf- and flower-branch—*of natural size;* 2, culm-sheath—*somewhat reduced*; 3, spikelet; 4, lower empty glume; 5, flowering glume; 6, palea; 7, staminal tube and anthers (young); 8, the same (older); 9, terminal imperfect flower; 10, ovary and style and stigmas; 11 caryopsis—*enlarged;* (Nos. 1 and 11 from King's Moulmein specimens; No. 2 from Kurz' drawing in the Herbarium of the Calcutta Botanic Garden; the rest from Helfer's specimens.)

2. OXYTENANTHERA ALBOCILIATA, *Munro in Trans. Linn. Soc.* xxvi. 129.

An evergreen or occasionally deciduous, densely tufted bamboo. *Culms* elongate, curved, 20 to 30 ft. long, ·5 to 1 in. in diameter, greyish-green, hispid above; nodes raised in a ring formed by the base of the sheath; internodes 6 to 15 in. long, walls moderately thick, ·2 to ·3 in. *Culm-sheaths* 4 to 8 in. long by about 6 in. broad, at first covered with dense tawny appressed hairs, afterwards smooth, somewhat truncated, folded and coriaceous at the base; ending at the truncated mouth in a narrow, slightly auricled, naked band; *imperfect blade* as long, and often somewhat longer than, the sheath, lanceolate, acuminate, broad and rounded at the base and decurrent; *ligule* very long, ·5 to 1 in., truncate, toothed. *Leaves* linear-lanceolate, 6 to 8 in. long, ·7 to 1 in. broad; rounded at the base into a short ·1 in. petiole; at the tip produced in a setaceous point; glabrous above, except for scabrous points near the margins, glaucescent beneath, scabrous on one or both margins; secondary veins 6 to 8, intermediate usually 4 to 5; no regular transverse veinlets, but frequent pellucid glands having that appearance on the lower surface; *leaf-sheaths* smooth, striate, ending in a smooth callus and truncate edge; *ligule* rather long, faintly ciliate. *Inflorescence* a large spreading panicle of spicate branchlets; spikelets in verticils of about 10 to 20, supported by yellow chaffy white ciliate bracts; rachis smooth, slender, 1 to 3 in. long between the verticils; *spikelets* slender, ·6 to ·8 in. long, often curved, ·1 in. broad, those bearing fertile flowers mixed with few sterile ones; *empty glumes* 1 to 2, ovate-acute, white-ciliate; then one male flower, followed by 1 or 2 hermaphrodite flowers; *flowering glumes* elliptic, acute or faintly emarginate, many-nerved, white-ciliate on the edges, convolute; *palea* shorter, often much shorter, ovate obtuse, 2-keeled, ciliate on the keels, that of last flower not keeled, convolute, ciliate only at the tip. *Stamens* long, exserted; *filaments* at first connected in a short thick tube, afterwards in a long, very membranous one; *anthers* long, greenish-yellow, long hirsute, apiculate. *Ovary* narrowly ovoid, much acuminate, pubescent, ending in a long *style* divided above into 2 white *stigmas*. *Caryopsis* elongate, oblong, cylindrical, acuminate. GIGANTOCHLOA ALBOCILIATA, *Kurz For. Fl. Burma* ii. 555.

Throughout Burma, chiefly in mixed forests. Collected by Falconer in Moulmein, Brandis in Houndraw valley and Toungnyo in 1880; Dr. Mason in Toungoo Hills in 1857; Kurz in Thaungyin and Pegu Yomas in 1871; J. W. Oliver at Pyinmana in 1891; P. J. Carter in Pegu; W. T. McHarg in Tenasserim in 1892.

This is the well-known *Wapyugale* (little white bamboo), also *Wagok* of Tenasserim, and it is easily recognized by its narrow, white-ciliate, curved spikelets, by the absence of a terminal imperfect flower, and by the long ligules of the culm sheath. From the dates given by collectors it appears to have flowered in 1857, 1871, 1880, 1891-92. It is a species of very little value, and is even troublesome in the teak plantations.

PLATE No. 61.—*Oxytenanthera albociliata*, Munro. 1, leaf-branch; 2, part of flower-panicle,—*of natural size;* 3 & 4, culm-sheath—*reduced to half;* 5, spikelet; 6, empty glume; 7, flowering glume; 8, palea; 9, palea of last flower; 10, staminal tube and anthers of lower male flower; 11, anthers; 12, ovary and stigmas—*enlarged.* (No. 3 from Kurz' figure in the Herbarium of the Royal Botanic Garden, Calcutta; the rest from his Thaungyin specimens.)

3. OXYTENANTHERA SINUATA, *n. sp. Gamble.*

Culms **and** ***culm-sheaths*** **not known.** ***Leaves*** 10 to 12 in. long, 1·2 to 1·5 in. broad, oblong-lanceolate, acuminate; rounded almost cordately at the base into a ·5 in. long, broad, thick, hairy petiole; ending above in a scabrous, twisted, setaceous point; somewhat scabrous above, softly pubescent beneath, scabrous on the edges; main vein hardly prominent, secondary veins 10 to 12 pairs, intermediate 7 to 8; *leaf-sheaths* glabrous or slightly pubescent, faintly striate, keeled, ending in a narrow ciliate callus and bearing a few long deciduous bristles; *ligule* rather short, thickly pubescent. *Inflorescence* a panicle with spicate branches bearing round heads of sterile and fertile spikelets; *rachis* sinuate, softly pubescent, joints ·5 to 1·5 in. long; heads up to ·5 in. in diameter; *spikelets* narrow, conical, ·3 to ·4 in. long, acuminate, minutely hairy, bearing 2 to 3 empty glumes and then 2 to 3 fertile flowers; *empty glumes* ovate, mucronate, ciliate on the edges, many-nerved; *flowering glumes* similar but longer, and longer mucronate, the uppermost convolute; *palea* of lower flowers blunt or bifid, 2-keeled, ciliate on the keels, 2- to 3-veined between, that of upper flowers long-acuminate, glabrous, not keeled. *Stamens* exserted, tube at first thick, enclosing the ovary, afterwards elongate, membranous; *anthers* narrow, connective produced into a hairy acumen. *Ovary* broadly ovate, hairy, surmounted by a long hairy *style* and plumose *stigma*. *Caryopsis* not known.

Malaya: collected at Seruman in Sunjei Ujong in 1885 (Herb. Singapore).

A very little known kind, said to be used for making baskets and to be called *Pokó, bulu miniak.* I also consider Ridley's specimens from Gunong Panti and Hulu Kahary, Johore, to belong to this, though they have only one fertile flower and a glabrous spikelet.

PLATE No. 62.—*Oxytenanthera sinuata*, Gamble. 1, leaf-branch; 2, flower branchlet—*of natural size;* 3, spikelet; 4, empty glume; 5, flowering glume of uppermost flower; 6, palea of lower flowers; 7, palea of upper flowers; 8, staminal tube; 9, anther; 10, ovary with style and stigmas—*enlarged.*

4. OXYTENANTHERA PARVIFOLIA, *Brandis MS.*

Apparently a large-sized bamboo. *Culms* up to 3 in. in diameter. *Culm-sheaths* 8 to 9 in. long, 8 to 10 in. broad, covered on the back with appressed brown hairs, rounded at the top and truncate, striate; *imperfect blade* 2 to 3 in. long by about 1 in. broad, ovate-acuminate, rounded at base and decurrent on the top of the sheath in a narrow, naked, slightly auricled band; *ligule* rather broad, dentate. *Leaves* linear-lanceolate, 3 to 5 in. long, about ·5 in. broad; rounded at base in a short ·1 in. petiole; the apex with a short subulate twisted point; smooth above, except on the marginal veins which are scabrous, pale and slightly pubescent beneath, scabrous on one or both margins; *leaf-sheaths* hairy at first, afterwards ending in a prominent callus and furnished with a few deciduous bristles at top; *ligule* long, acute, faintly dentate, pubescent. *Inflorescence* a large panicle of spicate branchlets bearing verticils of spikelets 4 to 10 to the verticil, supported by small polished bracts; rachis thin, wiry, 1 to 2 in. long between verticils. *Spikelets* narrow, ·6 to ·8 in. long by ·1 to ·2 in. broad, glabrous; many fertile mixed with few sterile; *empty glumes* 2 to 3, ovate, mucronate, glabrous, striate near the tip; after them usually 2 hermaphrodite flowers, then one imperfect; *flowering glumes* similar but longer; *palea* as long as flowering glume, 2-keeled, shortly ciliate on keels, shortly emarginate, 3—5-nerved on back; that of final flower not keeled, concave, glabrous. *Stamens* exserted; *anthers* rather short, obtuse. *Ovary* hairy, ovoid-acuminate; *style* long, slender, with 1-2 shortly plumose *stigmas.*

Yônzalin Valley in Burma, collected by D. Brandis in March 1880.

This species is distinguished from *O. nigrociliata* and *O. albociliata* by its having the edges of the glumes not ciliate and by its small leaves. It is known, according to Brandis, as *Tseikdoo-mindoo* (Burmese); *Wamo* (Karen).

PLATE No. 63.—*Oxytenanthera parvifolia*, Brandis. 1, leaf-branch; 2, part of flower-panicle—*of natural size;* 3, culm-sheath—*somewhat reduced;* 4, spikelet; 5, empty glume; 6, flowering glume; 7, lower flower palea; 8, uppermost flower palea; 9, ovary and style—*enlarged.* (All from Brandis' specimens.)

5. OXYTENANTHERA THWAITESII, *Munro in Trans. Linn. Soc.* xxvi. 129.

A straggling or subscandent, gregarious, reed-like bamboo. *Culms* 10 to 12 ft. long, or longer, about 1 in. in diameter, smooth, usually ending in a curved whip with verticils of small branchlets and very small leaves; branched from the base, the branchlets verticillate and sheathed; leaf- and flower-bearing branches on the same culm; nodes prominently jointed; internodes 12 to 18 in. long, rough, hirsute when young, walls thin, ·1 to ·2 in. thick. *Culm-sheaths* about 6 in. long, 3 to 4 in. broad, those of thicker shoots covered on the back with appressed, light brown hairs; those of younger and thinner shoots nearly glabrous, yellow, shining, the base ending in a coriaceous, separable ring, truncate at the mouth, ciliate on the margins, especially at the top; *imperfect blade* ovate, acuminate, 3 to 5 in. long by 1 in. broad, rounded at the base and then again decurrent along the top of the sheath, and ending in large, rounded, falcate auricles which are tipped with stiff curved bristles; *ligule* of larger older sheaths very long and long-fimbriate, that of younger and smaller ones

narrow, erose. *Leaves* very variable in size, those of old culms often 8 to 12 in. long, 1 to 1·5 in. broad; lanceolate acuminate, rounded or unequally attenuate at the base into a ·1 to ·2 in. petiole; above ending in a sharp, twisted, setaceous point; glabrous above, and with scattered hairs below, especially when young, margins scabrous; main veins narrow, yellow, shining below, not prominent above, secondary veins about 8 to 10 with 7 intermediates; no transverse veinlets, but few pellucid glands; *leaf-sheaths* striate, often very hirsute, keeled, ending in a rounded callus, those of larger leaves produced at the mouth to meet the ligule, those of smaller leaves ending in falcate auricles with a few long, stiff, deciduous bristles; *ligule* variable, sometimes long, sometimes very narrow. *Inflorescence* a huge, often leafy, panicle, with spicate branchlets bearing heads of more or less closely-packed spikelets, supported by small ovate bracts; the heads near the main rachis very large, 1·5 to 2 in. in diameter, those at the ends of the branchlets small, few-flowered, average heads about 1 in.; rachis smooth, striate. *Spikelets* often in pairs, ·3 to ·4 in. long, acute, pale, usually 1-flowered; *empty glumes* 2 to 3, ovate, mucronate, many-veined, sometimes ciliate on the edges; *flowering glume* ovate-acute, sharply and strongly mucronate, ciliate on the edges and somewhat pubescent near the top; *palea* concave, glabrous except the ciliate point, convolute, blunt. *Stamens* exserted, tube at first short and thick, afterwards elongated and very thin; *anthers* narrow, long-apiculate, the tip hairy. *Ovary* ovate-acuminate, produced into a hairy *style* which is divided at the top into 3 short plumose *stigmas*. *Caryopsis* elliptic-oblong, ·2 to ·3 in. long, glabrous, except the long mucronate apex formed by the base of the style which is hairy, embryo conspicuous. *Beddome Fl. Sylv.* ccxxxii. *tab.* ccxxxii. DENDROCALAMUS MONADELPHUS, *Thwaites Enum. Plant. Zeyl.* 376.

South India and Ceylon at from 3,500 to 6,000 feet elevation. It occurs in abundance in places on the Nilgiris, such as in ravines below Coonoor, Kotagiri, Melkunda, Sispara, in the Ochterlony Valley, &c. It is also found in the Anamalai and the Palghat Hills and the hills of Travancore. It was also collected by Beddome in Kurnool. I have also specimens from Wynaad collected by Mr. Rhodes Morgan, and specimens from Travancore from J. F. Bourdillon. Trimen's Ceylon specimens came from Rangula Hill, 4,000 feet.

It is at once recognized by its whip-like climbing branches and long-ciliate sheaths. I have examined an immense number of spikelets, but cannot find one which has more than one flower, although Beddome says 1 to 3 are fertile. Beddome says that in the Anamalais it is called *Watte*, and that the leaves are used for thatching; I never heard of its being used for any purpose on the Nilgiris. It is very frequently in flower, and I am not sure that it dies down after flowering. Wight's specimens were collected in Nilgiris in 1847 and 1851; C. B. Clarke's at Coonoor in 1870; G. King's in Ochterlony Valley in 1878; Beddome's in the Anamalais in 1865 and 1871; my own in various places in 1883 and 1889. In flower it much resembles *Dendrocalamus strictus*, and it is said by Munro to be this plant which is represented as that species in Plate 70 of Roxburgh's Coromandel plants; but it must, however, be noted that the Plate does not show monadelphous stamens. In my opinion it merely represents a poor specimen of *Dendrocalamus strictus*.

PLATE No. 64.—*Oxytenanthera Thwaitesii*, Munro. 1, leaf-branch; 2, part of flower-panicle—*of natural size;* 3, culm-sheath; 4, culm-sheath of young shoot—*somewhat reduced;* 5, spikelet; 6 & 7, empty glumes; 8, flowering glume; 9, palea; 10, staminal tube (young)

and stamens, style and stigmas; 11, staminal tube (older) opened out; 12, anther; 13, ovary, style and stigmas; 14, caryopsis; 15, leaf-sheath of large leaves. (No. 11 from Beddome's figure; the rest from my own specimens.)

6. OXYTENANTHERA MONOSTIGMA, *Beddome Flora Sylv.* ccxxxiii.

A medium-sized strong bamboo. *Culms* nearly solid, 10 to 15 ft. or more high, about 1 in. in diameter, densely covered with soft, pale yellow, velvety tomentum; nodes not very prominent; internodes long. *Culm-sheaths* thin, papery at the edges, striate, sparsely covered with white appressed stiff hairs, 6 to 9 in. long, about 3 in. at the base, and gradually attenuate upwards to the apex which is rounded on either side and has a deep sinus, to the bottom of which the imperfect blade is affixed; *imperfect blade* about 3 in. long, linear-lanceolate, striate; *ligule* long, often deeply fimbriate. *Leaves* variable in size according as they grow on leaf-branches or mixed with the flower spikes, pale green, 6 to 8 in. long, 1·5 in. broad, linear-lanceolate, acuminate, rounded at the base unequally into a ·2 to ·3 in. flat petiole; ending above in a setaceous twisted point; glabrous above, except for the scabrous points on veins near the margin and on the midrib, sparsely hairy and pale beneath, scabrous on one side of the margin; main vein yellow shining beneath, inconspicuous above, secondary veins 7 to 12, intermediate 5 to 7; *leaf-sheaths* striate, glabrous, or with scattered appressed hairs produced at the mouth to meet the ligule; *ligule* long, often ·3 in., acute or rounded. *Inflorescence* a large terminal panicle of spicate branchlets bearing dense globular heads of spikelets, heads often very large, especially at the main nodes of the central rachis, where they often reach 2 to 2·5 in. in diameter; rachis rounded, smooth, striate. *Spikelets* ·8 to 1 in. long, glabrous, less than 1 in. broad, long-spinose-apiculate, very numerous, fertile and sterile about equal in numbers; only one flower; *empty glumes* 2 to 3, lower small, ovate-mucronate, upper ovate-lanceolate, mucronate; *flowering glume* long, narrow, linear-lanceolate, long-mucronate, convolute; *palea* shorter than flowering glume, concave, not keeled, blunt. *Stamens* exserted, tube short and thick at first, afterwards long-cylindric; *anthers* long, about ·2 to ·3 in., narrow, long bristly-apiculate, the bristle somewhat hairy at the apex. *Ovary* ovate-acuminate, rounded, glabrous, ending in a long glabrous *style*, terminating in a feathery, or, in older flowers, a curved, thickened *stigma*. *Caryopsis* narrow, linear-oblong, grooved, ending in a conical mucro formed by the persistent base of the style, embryo conspicuous. *Beddome Icones Plant. Ind. Or., tab.* ccxxxiv. 56. BAMBUSA RITCHEYI, *Munro in Trans. Linn. Soc.* xxvi. 113. SCHIZOSTACHYUM HINDOSTANICUM, *Kurz in Proc. As. Soc. Beng.* xlii. 232.

Western Ghats and hills of South-West India from Mahabaleshwar to the Anamalai Hills. Collected by Ritchie at Kala Nuddi in 1852, No. 820; Brandis on Sattara Ghâts, 1870; R. S. Fagan at Mahabaleshwar, 1892; W. A. Talbot in North Kanara, Nos. 857, 905, in 1884, also in 1889; R. C. Wroughton in Poona district and A. D. Wilkins in Ahmednagar, 1892; Beddome in Anamalai Hills; Brandis in Coorg.

I feel sure I am right in identifying *Bambusa Ritcheyi*, Munro, with *Oxytenanthera monostigma*, Beddome; and to this Munro himself (see MS. note in Kew Herbarium) agreed. The species is very well marked by the velvety culms, narrow culm-sheaths, long narrow pointed spikelets with only one flower, and glabrous ovary and style. The leaves are very variable, but Brandis' specimens and Munro's descriptions agree well with those sent by Bombay officers, and the narrower, smaller leaves belong mostly to flowering branchlets.

Ritchie gave the vernacular name as *Choomaree;* Brandis' specimens bear the names *Chiwa, chiwan, chawa;* Wroughton's and Wilkins' specimens those of *Huda, udhe, manga, tandali.* Ritchie says it is used for basket-work; Wroughton that it is one of the commonest bamboos largely cut and used for all purposes, but not really very good. I am not sure that the stigma is always undivided, for I have found some that separated on maceration, and I am rather in doubt whether Munro's specific name should not have precedence. I cannot trace this species with certainty in Dalzell and Gibson's Bombay Flora, but it may be what is meant by the *Chiwaree* bamboo identified by him as *Bambusa Arundo*, Klein, *Nees in Linnæa*, ix. 471, though the description does not agree.

PLATE No. 65.—*Oxytenanthera monostigma*, Beddome. 1, leaf-branch; 2, part of flower-panicle; 3, portion of culm with sheath; 4, culm-sheath—*of natural size;* 5, spikelet; 6, empty glume; 7, flowering glume; 8, palea; 9, staminal tube and anthers; 10, anther; 11, ovary, style and feathery stigma; 12, caryopsis—*enlarged.* (No. 3 from fresh Bombay specimens; rest from Brandis' Sattara specimens.)

7. OXYTENANTHERA STOCKSII, *Munro in Trans. Linn. Soc.* xxvi. 130.

A slender bamboo. *Culms* grey-green, glabrous or covered with close soft pubescence, solid or with a small cavity, with few branches from the nodes, which are marked by a ring and soft pubescence; internodes 6 to 12 in. long. *Culm-sheaths* 6 to 9 in. long, 3 to 7 in. wide at base, tapering gradually upwards and somewhat concavely truncate at top; densely appressed brown hairy on the back, ciliate on the margins; *imperfect blade* subulate acuminate, rounded at the base, and again expanded into a rounded, waved, long-fringed auricle on the top of the sheath; *ligule* long, ·3 in., deeply fimbriate, conspicuous. *Leaves* linear-lanceolate, 4 to 8 in. long, ·4 to ·7 in. broad, rounded or attenuate at the base into a very short ·1 in. petiole; at top ending in a setaceous point; glabrous above, except near the edges where the veins are scabrous, glabrous or hairy below, scabrous on the margins; main vein narrow, pale, shining beneath, secondary veins 5 to 6 with 6 or 7 intermediate, not prominent; *leaf-sheath* striate, glabrous or at first pubescent, mouth somewhat produced; *ligule* rather long, dentate. *Inflorescence* a large panicle of spicate heads, with many closely-packed spinous spikelets, the heads supported by rounded chaffy bracts; rachis smooth, striate, the distance between verticils 1 to 2 in.; heads 1 in. in diameter. *Spikelets* ·4 to ·5 in. long, narrow, glabrous, mucronate, many fertile mixed with a few sterile. *Empty glumes* 2, ovate-mucronate, 5- to 7-nerved; then two hermaphrodite flowers; *flowering glumes* ovate, sub-acute with a strong mucro on the back; *palea* of lower flower as long as flowering glume, 2-keeled, ciliate on the keels, 5-nerved between, blunt, that of upper flower concave, convolute, blunt. *Stamens* long exserted, tube rather persistent; anthers short, acute. *Ovary* ovoid, hairy, with a long hairy *style* and undivided purple plumose *stigma*. *Caryopsis* not seen. *Beddome Fl. Sylv.* ccxxxiii.

Concan, collected by Stocks; by W. A. Talbot at Carwar in 1889, and at Coompta River in 1884; usually cultivated.

This species is not very well known, but it is recognized by the acute and not apiculate anthers and 2-flowered spikelets. I have, as did Brandis, examined many spikelets without finding the 2- to 3-fid stigma. All I have seen are undivided. Talbot gives the Kanara name as *Konda man*, but says the commonest name is *Mace* (*Més?*). I think that an *Oxytenanthera* collected by myself in the S. E. Wynaad, Nilgiris, with

narrow leaves, long petioles, and a narrow papery culm-sheath much resembling that of *Dendrocalamus strictus*, which this does to some extent, may probably prove to be this species; but there is not enough evidence as yet.

PLATE No. 66.—*Oxytenanthera Stocksii*, Munro. 1, leaf-branch; 2 & 3, flowering branches—*of natural size;* 4, culm-sheath—*slightly reduced*; 5, spikelet; 6, empty glume; 7, flowering glume; 8, palea of lower flowers; 9, palea of upper flowers; 10, anther; 11, ovary and stigmas—*enlarged.* (All from specimens received from Mr. W. A. Talbot.)

8. OXYTENANTHERA BOURDILLONI, *n. sp. Gamble.*

A moderate-sized bamboo forming open clumps with rather a straggling habit. *Culms* with long internodes. *Culm-sheaths* coriaceous in texture, 6 to 12 in. long, often 6 in. broad, glabrous except for a few stiff black hairs below, striate, only slightly narrowed at the truncate top; *imperfect blade* 2 to 3 in. long, triangular, very sharply mucronate, striate, glabrous except for a few stiff black hairs within, decurrent at the base into rounded, recurved, entire wings which line the whole of the upper edge of the sheath; *ligule* ·2 in. long, glabrous, faintly serrate. *Leaves* linear-lanceolate, acuminate, thin, 6 to 9 in. long by 1 to 1·5 in. broad; unequally attenuate at the base into a ·2 in. long petiole; ending above in a twisted scabrous point; smooth above, except near the margins and midrib where there are scabrous papillæ, smooth below, edges scabrous; main vein narrow shining below, secondary veins not prominent, 7 to 8, with usually 7 intermediate; *leaf-sheath* striate, soft, ending in a pair of shining calluses with a depression between, one often rounded, short, the other long, almost acute, slightly produced at the mouth to meet the ligule; *ligule* long, serrate. *Inflorescence* a large panicle of spicate branchlets bearing globular heads of many spikelets, the heads about 1·5 in. apart and 1·5 to 2 in. in diameter; rachis soft, striate, fistular. *Spikelets* ·7 to ·8 in. long by ·1 to 2 in. broad, 3-flowered, mucronate, glabrous except on the edges of the palea; *empty glumes* 2, ·2 to ·4 in. long, ovate, mucronate, many-nerved; *flowering glume* ·6 to ·7 in. long, mucronate, that of lowest flower longer that the next; *palea* 2-keeled, ciliate on the keels, obtuse, 3-nerved between keels, that of uppermost flower only grooved on the back above and there ciliate, acute; terminal rachilla ciliate, with a short setaceous imperfect flower. *Stamens* exserted, tube thick when young, *anther* apiculate. *Ovary* ovoid-acute, hairy, surmounted by a hairy *style* dividing into 3 small sub-plumose *stigmas*. *Caryopsis* linear-oblong, ·4 in. long, crowned by the hairy persistent enlarged base of the style, grooved on one side, embryo conspicuous.

Western Ghats of Travancore: "grows only on steep precipitous places and wet rocks at elevations of 3,000 to 4,000 ft."—*J. F. Bourdillon.*

This interesting species is at once recognizable from the rest by its soft texture, leathery sheath, the curious calluses on the leaf sheath, and the long 3-flowered spikelet. The flowers seem to be all hermaphrodite, the uppermost only producing seed; but the available specimens are rather old, and many spikelets have had to be examined to find the stamens. It was first collected in flower by J. F. Bourdillon in 1889, and I obtained specimens through the kindness of Mr. M. A. Lawson, the Director of the Botanical Department in South India. Afterwards, Mr. Bourdillon kindly procured me the leaves and culm-sheaths, and I have great pleasure in associating his name with his discovery. Judging by the culm-sheaths, the culms must reach 2 in.

in diameter at least. The long flowering glume of the lowest flower gives the spikelet the appearence of being double.

Plate No. 67.—*Oxytenanthera Bourdilloni*, Gamble. 1, leaf-branch; 2, part of flowering panicle;—*of natural size* 3, culm-sheath—*somewhat reduced*; 4, spikelet; 5 & 6, empty glumes; 7, flowering glume; 8, palea of lower flower; 9, palea of uppermost flower; 10, staminal tube and stamens; 11, terminal rachilla; 12, ovary, style and stigmas; 13 & 14, caryopsis—*enlarged*.

Sub-tribe 3.—DENDROCALAMEÆ.

Spikelets 2- to many-flowered, usually in heads on the branches of a panicle; ovary hairy above; caryopsis small with a crustaceous pericarp . . . . 7. *Dendrocalamus.*
Spikelets 2-flowered, in heads on the branches of a panicle; ovary glabrous above; caryopsis large with a thick fleshy pericarp . . . . 8. *Melocalamus.*
Spikelets 1-flowered.
  Caryopsis small, depressed globose, with crustaceous pericarp . . . . . 9. *Pseudostachyum.*
  Caryopsis elongate, beaked.
    Pericarp crustaceous . . . . 10. *Teinostachyum.*
    Pericarp thick, separable . . . . 11. *Cephalostachyum.*

7. Dendrocalamus, *Nees.*

Arborescent bamboos, always unarmed, sometimes of very large size. *Culms* usually erect from a densely ramified rootstock. *Culm-sheaths* deciduous, often very large, variably auricled, usually elongate; *imperfect blade* narrowly triangular. *Leaves* shortly petiolate, variable in size, sometimes very broad, with no transverse veinlets, but frequently with pellucid glands instead. *Inflorescence* a large compound panicle, the spikelets usually in round congested heads in long spikes. *Spikelets* ovate, acute or obtuse, flowers few, rarely more than six, usually hermaphrodite. *Empty glumes* 2 to 3, many-nerved, ovate, acute or mucronate. *Flowering glume* similar to empty glume. *Paleæ* ovate, acute or truncate or emarginate or cleft, those of lower flowers 2-keeled, ciliate, those of uppermost flower usually rounded on the back and not ciliate. *Lodicules* none or very scarce. *Stamens* 6, filaments free; anthers mucronate or with tufted hairs. *Ovary* ovoid, or sub-globular, often depressed, hairy above; *style* long, usually hairy, base persistent; *stigma* usually simple. *Caryopsis* small, the seed surrounded by a crustaceous or hardened pericarp, the position of the embryo not usually visible on the surface.

Distrib.—Sixteen species are, so far, known, consisting of the fifteen here described and one (*D. latiflorus*, Munro) found in China and the island of Formosa. Of the Indian species, one (*D. strictus*) is the most widespread and common of all Indian bamboos; the rest are confined to the North-East Himalaya, the Indo-Burmese and the Burma-Malay regions. *D. giganteus* is the largest of the Indian bamboos.

Analysis of the species.

Spikelets in spinous, congested, spicate heads, leaves usually narrow—Section I.
  Spikelets usually hirsute, caryopsis rounded.
    Anther-tips acute, spikelets moderately hirsute . . . . 1. *D. strictus.*
    Anther-tips blunt, spikelets very silky-hairy . . . . 2. *D. sericeus.*
  Spikelets usually glabrous, caryopsis elongate . . . . 3. *D. membranaceus.*

Spikelets in large, soft, congested heads, leaves usually broad—SECTION II.
Spikelets acute, culm-sheaths very hairy.
Heads large, 1·5 in. broad, dark-coloured; leaf- and culm-sheaths conspicuously fringed . . . . 4. *D. sikkimensis.*
Heads not more than 1 in. broad, pale; leaf-sheaths naked, culm-sheaths little fringed . . . . 5. *D. Hookeri.*
Spikelets blunt, culm-sheaths glabrous or nearly so.
Culm- and leaf-sheaths not fringed . . . . 6. *D. Hamiltonii.*
Culm- and leaf-sheaths long-fringed . . . . 7. *D. patellaris.*
Spikelets few, in small heads, many sterile—SECTION III.
Spikelets long, ovate-acute.
Culm-sheaths broad, nearly glabrous, ligule long, palea bifid . . . 8. *D. giganteus.*
Culm-sheaths hirsute, ligule short, palea acute . . . . 9. *D. calostachyus.*
Spikelets short, blunt; culm-sheaths elongate, thin . . . . 10. *D. longispathus.*
Spikelets short, ovate.
Heads moderately large, many-flowered . . . . 11. *D. Brandisii.*
Heads small, few-flowered.
Leaves without fringed auricles . . . . 12. *D. flagellifer.*
Leaves with long-fringed auricles . . . . 13. *D. longifimbriatus.*

Leaves unknown.

Spikelets small, in soft, rather large, heads . . . . 14. *D. Parishii.*
Spikelets large, white, and in soft, loose heads . . . . 15. *D. Collettianus.*

SECTION I.

1. DENDROCALAMUS STRICTUS, *Nees in Linnœa* ix. 476.

A deciduous, densely-tufted bamboo, with strong culms which are solid, or with only a small cavity. *Culms* variable in size according to climate, 20 to 50 ft. high, 1 to 3 in. in diameter, glaucous-green when young, dull green or yellowish when old; nodes somewhat swollen and in open situations bearing leafy, often deflexed, branches even from the base, lower nodes often rooting; internodes short, 12 to 18 in. long; upper branches curved, drooping; walls thick. *Culm-sheaths* variable, lower ones shorter, 3 to 12 in. long, covered on the back with golden brown stiff hairs, sometimes glabrous in dry localities, striate, rounded at the top, ciliate at the edges, very slightly auricled; *imperfect blade* triangular, subulate, hairy on both sides, especially within; *ligule* narrow. *Leaves* linear-lanceolate, varying from 1 to 2 in. long in dry localities, up to 10 in. in moist ones, and ·2 to 1·2 in. broad; rounded suddenly at the base into a short petiole; gradually narrowed upwards into a sharply acuminate, twisted point; rough and often hairy above, softly hairy beneath, scabrous on the edges; main vein prominent, secondary veins 3 to 6 pairs, intermediate 6 to 8, no transverse veins, but frequent pellucid dots between the veinlets; *leaf-sheaths* striate, hairy, ending in a prominent callus and short auricle with a few wavy, deciduous ciliæ; *ligule* narrow, serrate. *Inflorescence* a large branching panicle of large, dense, globular heads, 1·5 to 2 in. apart; rachis rounded, smooth. *Spikelets* spinescent, usually hairy, the fertile intermixed with many sterile smaller ones, ·3 to ·5 in. long and ·1 to ·2 in. broad, with 2 to 3 fertile flowers; *empty glumes* 2 or more, ovate, spinescent, many-nerved; *flowering glumes* ovate, ending in a sharp spine surrounded by ciliate tufts of hair; *paleæ* ovate or obovate, emarginate, lower ones 2-keeled, ciliate on the

keels and 2-nerved between them, uppermost not keeled, often nearly glabrous, 6 to 8-nerved. *Stamens* long-exserted, filaments fine; *anthers* yellow, shortly apiculate. *Ovary* turbinate, stalked, hairy above and surmounted by a long *style* ending in a purple feathery *stgima*. *Caryopsis* brown, shining, ovoid to sub-globose, ·3 in. long, hairy above, beaked with the persistent base of the style, pericarp coriaceous. *Miq. Fl. Ind. Bat.* iii. 421; *Munro in Trans. Linn. Soc.* xxvi. 147; *Beddome Fl. Sylv.* ccxxxv. *t.* ccexxv; *Brandis For. Flora* 569, *t.* 70; *Kurz For. Fl. Burma* ii. 558, *Ind. Forester* i. 346; *Voigt Hort. Sub. Calc.* 718. BAMBOS STRICTA, *Roxb. Corom. Pl.* i. 58, *t.* 80. BAMBUSA STRICTA, *Roxb. Hort. Beng.* 25, *Fl. Ind.* ii. 193; *Kunth in Journ. de Phys.* (1822) 148, *Enum.* 431; *Schultes Syst. Veg.* vii. 1339; *Ruprecht Bamb.* 56, *tab.* xii, fig. 56; *Steudel Syn.* 330; *Dalz. and Gibs. Bomb. Fl.* 299. BAMBUSA VERTICILLATA, *Rottler* (according to Munro). BAMBUSA PUBESCENS, *Lodd. in Lindl. Penny Cycl.* iii. 357 (1835). BAMBUSA TANŒA, *Buch.-Ham. in Wall. Cat.* 5038A.

Dry hills throughout India and Burma. It is found to the north in the Punjab Salt Range, and extends down along the base of the Himalaya and in the Siwalik Range to Nepal, but does not occur in Sikkim or in the Assam Valley. It is common throughout the hills of the Eastern and Western Gháts and of Central and South India, ascending to 3,000 ft., and is found in the Eng and drier upper mixed forests throughout Burma, but is absent from Ceylon. Southwards, it is said to extend to Singapore and Java (Büse and Munro). In the valleys of Burma and South India it reaches a large size with hollow culms, longer leaves and culm sheaths; but in the dry Deccan hills and in the Siwaliks it is small and has nearly solid culms, small leaves and sheaths. It has been found in an interesting, nearly glabrous-flowered, variety, in the Great Cocos Islands by Dr. D. Prain (Voyage of the 'Investigator').

This is the most common and most widely spread and most universally used of the Indian bamboos, and is commonly known as the 'male bamboo.' Its culms are employed by the natives for all purposes of building and furniture, for mats, baskets, sticks and other purposes. It furnishes, when solid culms are procurable, the best material for lance shafts. In Burma, when large culms are obtainable, they are much in request for masts for native boats. It flowers gregariously over large areas, as it did in the Central Provinces in 1865; in Garhwal in 1879; in Oudh in 1880; in Kurnool in 1887; in the Golgonda Hills in 1890, and in North Arcot in 1891; but it may be found flowering sporadically, a few clumps at a time, almost every year, in any locality, and such clumps then usually die off. These flowerings, however, do not produce as much good seed as when the gregarious flowering takes place. The flowers appear in the cold season between November and April, the seed ripening in June. The leaves fall in February or March, and the young new ones appear in April. The young culms are rather late, usually beginning to appear in July some time after the rains begin. It is locally known in North India as *Bans* and *Bans kaban;* it is *Karail* (Bengali), *Salia bans* (Uriya), the Telugu *Sadanapa Vedru* or *kauka;* the Burmese *Myinwa.* Dalzell and Gibson give the Bombay names '*Bans*' and '*Oodha*,' but a series of specimens received from Bombay from Messrs. Wroughton, Millett, Osmaston, Fisher, Betham, show *Oodha* to be *Bambusa Ritcheyi* (*Oxytenanthera monostigma*), and that this species is called *Més* (Poona), *Manwel, búndhi* (Thana), *Kaniu wán* (Panch Mahals). In size of culm and in the size and characters of the culm-sheaths, leaves and spikelet heads it is most variable. On dry hill slopes in the Siwaliks, on the rocky hills of Central India (*e.g.*, Mount Abu) and the Deccan, it

is small, with narrow, very hard, nearly solid culms, small often hairy culm-sheaths, and short leaves; while in Burma, in Bengal, and in moister localities in South India, the culms are much larger, the culm-sheaths longer and stouter, and the leaves longer. It is very easily grown either from seed or from root offsets, and the culms take 5 years to form clumps in favourable localities. On its growth and cultivation, Colonel Doveton's excellent paper in '*Indian Forester*,' vol. ix, p. 529, may be consulted. The following account of its uses in the Central Provinces (and indeed the remarks apply really to all places in India when it is the principal species) is worth quoting from that paper:—"This bamboo is used for rafters and battens, spear and lance-shafts, "walking sticks, whip handles, stakes to support sugarcane, for the manufacture of "small mats used like slates in roofing, mats for floors, covers of carts, sieves, hand "punkahs, umbrellas, light chairs and sofas, vessels for holding grease and oil, bows, "arrows and cordage, and for the manufacture of many other minor articles. It is "also used for the buoyage of heavy timbers in rafting, and when converted into "charcoal, is in request for the finer smith's work. Dry stems are also used for "torches, and the production of fire by friction. The leaves are much sought after "as food for buffaloes and are fairly good fodder for horses. The seed is used in "times of famine as food grain, and while wheat sold at 12 seers for the rupee, "bamboo seed sold at from 40 to 50 seers. It will probably come into use for the "consolidation and support of embankments."

Plate No. 68.—*Dendrocalamus strictus*, Nees; the larger leaf- and flower-bearing variety. 1, leaf-branch; 2, part of flower-panicle,—*of natural size;* 3, culm-sheath—*reduced to about* $\frac{1}{4}$; 4, spikelet; 5, flowering glume; 6, palea; 7, anther; 8, ovary and style; 9, 10 caryopsis; 11 leaf-sheath—*enlarged.* (1 to 9 from a specimen gathered by myself in the Northern Circars, 10, 11 from Dehra Dún specimens.)

Plate No. 69.—*Dendrocalamus strictus*, Nees; the smaller leaf- and flower-bearing variety of the Deccan and Carnatic. 1, leaf-branch; 2, part of flower-panicle—*of natural size;* 3, culm-sheath—*reduced;* 4, spikelet—*enlarged* (all from my Madras specimens); *A*, spikelet of the variety (var. *Prainiana*) from Table Island, Great Cocos; characterized by smaller spikelets, fewer flowers and nearly glabrous flowering glumes.

Note.—(The excellent figure by Fitch in Brandis' Forest Flora shows almost better than either of these two Plates the most usual form and size of the flower-heads. The fig. 80 of Roxburgh's Coromandel Plants is a poor one, but represents, in my opinion, this species and not, as Munro says, *Oxytenanthera Thwaitesii.* The spikelet clearly shows separate and not monadelphous stamens.)

2. Dendrocalamus sericeus, *Munro in Trans. Linn. Soc.* xxvi. 148.

A densely tufted bamboo with strong culms resembling those of *D. strictus*. *Culm-sheaths* striate, long-ciliate on the edges, covered with stiff bristles with swollen bases; *imperfect blade* short, triangular, acute. *Leaves* lanceolate, long acuminate, 5 to 15 in. long, ·7 to 1 in. broad, usually rounded at the base into a longish petiole; hairy or hispid above, hairy beneath, scabrous on the edges; point long, twisted; main vein prominent beneath, shining, secondary veins 6 or 7 pairs, intermediate about 7; *leaf-sheaths* striate, somewhat keeled, strigosely hairy in lines down the sides, ending in a ciliate truncate callus; *ligule* narrow, fimbriate, serrate. *Inflorescence* a large panicle

with stout branches bearing distant globular heads 1·5 to 2 in. apart and supported by glabrous or sparsely hairy triangular bracts; rachis rounded, striate, hairy above. *Spikelets* spinescent, acute, densely silky, hairy, the fertile intermixed with many small sterile ones, ·3 to ·4 in. long, with 2 to 3 fertile flowers; *empty glumes* 2, blunt, many-nerved, densely silky on the edges and upper part outside, glabrous within; *flowering glume* ovate-acute, or ending in a long, sharp spine and bearded with silky hairs below it; *palea* acute or emarginate, that of lower flowers 2-keeled, ciliate on the keels and hairy on the wings, glabrous and 3-nerved between the keels, that of the uppermost flower long, acute, rounded on the back, not keeled, silkily hairy at the tip, about 9-nerved. *Stamens* apparently little exserted; *anthers* yellow, bluntly apiculate and sometimes minutely penicillate. *Ovary* narrowly ovoid, gradually passing into a long hairy *style* ending in a purple plumose *stigma*. *Caryopsis* not known.

Summit of Mount Parasnáth, Chota Nagpore, Bengal, at 4,000 feet, where it has been collected by Hooker, Thomson and Kurz, the two latter finding flowers in 1858 and 1871 (?). It is not known from any other locality.

As remarked by Munro, this species has very few definite characters to distinguish it from *D. strictus*, but it has a distinct appearance owing to the spreading silky pubescence on the spikelets. I do not find the uppermost palea to be keeled as Munro describes it, and I consider the blunt anther tips, more pointed paleæ, and less depressed ovary the best characters; for I have seen some Chota Nagpore specimens of *D. strictus* which come near it in the pubescence.

PLATE No. 70.—*Dendrocalamus sericeus*, Munro. 1, leaf-branch; 2, part of flower-panicle,—*of natural size;* 3, spikelet; 4 & 5, flowering glume; 6, palea of lower flowers; 7, palea of uppermost flowers; 8, anther; 9, ovary—*enlarged.* (All from Thomson's specimens.)

3. DENDROCALAMUS MEMBRANACEUS, *Munro in Trans. Linn. Soc.* xxvi. 149.

A moderate-sized strong-growing bamboo forming loose clumps. *Culms* very straight, 60 to 70 ft. high, up to 4 in. in diameter, when young covered with white powdery deciduous scurf, green when old; nodes strongly ringed; those near the base bearing rootlets; internodes 9 to 15 in. long; upper branches thin, drooping, leafy. *Culm-sheaths* longer than the internodes, 12 to 20 in. long, 5 to 8 in. broad, glabrous outside or with appressed dark brown stiff hairs, narrowed in the upper third into a dark brown, waved, fringed auricle to which the *imperfect blade* is attached; *imperfect blade* long, narrow, reflexed, with brown hairs on both sides, but especially within at the base, 12 to 16 in. long by about 1 in. broad, tapering to a point; *ligule* up to ·4 in. long, hairy within and roughly serrate. *Leaves* on slender branchlets, thin, pale, lanceolate, 5 to 10 in. long, ·5 to ·8 in. broad, rounded or attenuate at the base into a short petiole finely twisted, acuminate, hispid above, hairy on the midrib beneath, retrorsely scabrous on the margins; main vein prominent, glabrous, secondary veins 4 to 7 pairs, intermediate 7 to 9; *leaf-sheaths* striate, ending in a callus, cleft nearly to the base, falcate-auricled and with long purplish ciliæ, very white-hairy when young; *ligule* obtuse, very short, hairy within, longer and ciliate in young seedling specimens. *Inflorescence* a large compound panicle with distant globular heads, 1 to 2 in. apart; rachis glabrous or often white-pruinose in the upper part, heads ·7 to 1 in. in diameter, spinescent. *Spikelets*

slightly compressed, glossy, nearly glabrous, ·4 to ·5 in. long by ·1 to ·2 in. broad, with 2 to 3 fertile flowers; *empty glumes* 2, ovate, blunt or acute; *flowering glumes* ovate, often ciliate on the edges, mucronate, striate, glabrous; *palea* as long as flowering glumes, rather blunt, those of lower flowers keeled, ciliate on the keels and 3-nerved between them, that of uppermost flower rounded and nearly glabrous, few-nerved, acute. *Stamens* exserted, filaments long, fine; *anthers* yellow, shortly apiculate. *Ovary* ovoid, hairy above, glabrous below, ovate, produced into a long hairy *style* ending in a purple plumose *stigma*. *Caryopsis* broadly ovate, rounded at base, ·2 to ·3 in. long, grooved on one side and somewhat flattened, ending in a sharp point formed by the persistent base of the style; embryo distinct. *Kurz For. Fl. Burma* ii. 560.

Moist forests and low ground in Eastern Burma down to Tenasserim. It has been collected in Martaban by Wallich in 1827; in the Yônzalin valley by Brandis in 1857 and 1862; in Tenasserim by Beddome in 1879; in the Yomas by Kurz in 1871; and in the Wuntho and Pinhwe forests by J. W. Oliver in 1890.

In its inflorescence, this species resembles glabrous forms of *D. strictus*, and may easily be mistaken for it. It is, however, at once distinguishable by the nearly glabrous spikelets, thinner leaves, less rounded at the base, culm-sheaths with waved hairy auricles and recurved apical leaf and more elongate grooved caryopsis. It is used in building. The Burmese names vary, for Kurz calls it *Wa-ya*, Brandis *Wa-yai*, *wamu*, and Oliver *Wapyu*.

PLATE No. 71.—*Dendrocalamus membranaceus*, Munro. 1, leaf-branch; 2, part of flower-panicle—*of natural size;* 3, culm-sheath—*reduced;* 4, spikelet; 5, palea, stamens and pistil; 6, palea of lower flower; 7, palea of upper flower; 8, ovary and style; 9, caryopsis—*enlarged;* 10, leaf-sheath of seedling plant (from plant grown from Burma seed); 11, leaf-sheath of older plant (all, except 10, from Brandis and Kurz' Burma specimens).

4. DENDROCALAMUS SIKKIMENSIS, *Gamble in Hooker Ic. Plant. t.* 1770.

A large bamboo with cæspitose stems and few culms. *Culms* large, 50 to 60 and more feet high, naked below, branched above, 5 to 7 in. in diameter, dark green; *nodes* ringed; *internodes* 18 in. long rough; walls 15 in. thick. *Culm-sheaths* large, 12 in. long by 15 in. broad, densely covered with a dark golden brown felt of matted stiff hairs, broad at the top; *imperfect blade* lanceolate, variable, usually as long as the sheath, 2 to 3 in. broad, recurved, hairy on both faces and decurrent on each side into a large recurved, falcate auricle which is fringed with long (often nearly 1 in.) curved, fibrous, pale bristles; *ligule* about ·2 in. broad, glabrous, sharply serrate. *Leaves* variable in size, those of ordinary branches 6 to 10 in. long by 1·5 to 2 in. broad, unequal sided, oblong-lanceolate, acuminate in a twisted black tip; rounded at the base into a short, thick petiole; smooth above, strigosely hirsute and rough below, edges scabrous; main vein prominent, secondary veins not prominent, usually about 10 pairs: those of young plants and shoots elliptic-acuminate up to 12 in. long and 3 in. broad; main vein rather prominent, secondary veins 12 pairs, intermediate 7; *leaf-sheaths* smooth, glabrous, shining, ending in a small ciliate callus and furnished at the edges with falcate hairy auricles fringed with stiff bristles; *ligule* short, hairy, often long-fringed or fimbriate. *Inflorescence* a large panicle with stiff nodose branches, bearing large red-brown globose heads usually 2 in. apart and 1·5 in. in diameter; rachis dull brown, faintly pubescent. *Spikelets* lanceolate, somewhat blunt, ·5 to ·7 in. long; *empty glumes* 3 to 4, oval,

rounded, keeled and ciliate on the keels, otherwise glabrous; fertile flowers 2 to 3; *flowering glume* ovate, acute, glabrous, mucronate, ciliate on the edges; *palea* of lower flowers 2-keeled, densely shaggy on the keels and blunt, sometimes slightly bifid at the tip, many-veined; *palea* of uppermost flower not keeled, acute, hairy at tip, many-veined; final flower sterile, reduced to a thin, papery glume. *Stamens* exserted, yellow (?), acute. *Ovary* sub-globular, hairy, with a short, thick, hairy *style* and club-shaped hairy *stigma*. *Caryopsis* obovate-depressed, apiculate, shining above with a few hairs, wrinkled below. *Gardener's Chronicle* 6th June 1890 and 3rd December 1892.

Hills of the North-East Himalaya in Sikkim and Bhutan, 4,000 to 6,000 feet; and at Tura Peak, Garo Hills, at 3,500 feet. Also cultivated in the Calcutta Botanic Garden, at Peradeniya in Ceylon, in the Nilgiris and elsewhere from seed collected by R. Pantling in 1885. Also grown in the Royal Gardens, Kew; at Castlewellan, County Down and other places in Europe. Our flowering specimens are due to Mr. Pantling's energy.

This beautiful bamboo is the largest in Sikkim, where it has bigger culms than those of *D. Hamiltonii*, and is the one preferred by Lepchas and Bhutias for making the 'chungas' for carrying water and milk, and for churning butter. It is known to the Lepchas by the name of *Pugriang* and to the Garos as *Wadah* (G. Mann). The leaves are said to be poisonous to cattle in Sikkim, and specimens sent for identification in 1893 to Mr. J. F. Duthie as having caused death to horses who had eaten some from the same clump, proved to belong to this species. Mr. Mann's splendid Tura specimens show the ligules as not fringed, but the imperfect blades bearing beautiful long-fringed auricles. The species is readily distinguished by its large flower heads, densely velvety felted stem-sheath and the long-ciliate auricles of the leaf-sheaths.

PLATE No. 72.—*Dendrocalamus sikkimensis*, Gamble. 1, leaf-branch; 2, part of flower-panicle—*of natural size;* 3, culm-sheath (old); 4, apex of stem-sheath from young shoots—*reduced*; 5, spikelet; 6, spikelet, open; 7, palea of lower flowers; 8, palea of upper flowers; 9, anther; 10, ovary with style and stigma; 11 & 12, caryopsis with section—*enlarged.* (Nos. 1, 2, 5, 6, 8, 9, 10 from Plate 1770 of Hooker's Icones Plantarum; No. 3 from Mr. G. Mann's Garo Hills specimen; rest from specimens of Mr. Pantling's collecting.)

6. DENDROCALAMUS HOOKERI, *Munro in Trans. Linn. Soc.* xxvi. 151.

A large bamboo with cæspitose stems and long curving branches. *Culms* large, 50 to 60 ft. high, usually naked below, much-branched above, 4 to 6 in. in diameter, dark green, lower internodes somewhat rough hairy, walls about 1 in. thick; internodes 18 to 20 in. long. *Culm-sheaths* large, very broad at base when old, narrower in younger stems or on the upper branches, about 16 in. broad at base, 8 to 12 in. long, densely covered with black or brown hairs outside, glabrous inside, narrowed above to 2 to 3 in. where the imperfect blade is inserted, and furnished with small rounded auricles covered with long stiff ciliæ, edges ciliate: *imperfect blade* rounded at base, triangular-cuspidate above or elongate-cuspidate, 3 to 7 in. long, hairy above, glabrous below; *ligule* ·2 to ·3 in. long, glabrous, sharply serrate. *Leaves* large, rounded at base into a very short petiole, somewhat unequal-sided, oblong-lanceolate, with a long twisted, hispid, acuminate tip; smooth above, rough below, and with scattered hairs near the base, scabrous on the edges; main vein very prominent, yellow, shining, secondary veins 8 to 16 pairs, conspicuous, intermediate usually 7 to 8, with pellucid dots between, bars like transverse veinlets

apparent when dry; *leaf-sheaths* striate, hairy below, glabrous and brown shining above, truncate or somewhat produced at the mouth, which is sometimes furnished with a few stiff long bristles, callus large; *ligule* conspicuous, truncate or produced, glabrous. *Inflorescence* a large compound panicle bearing at intervals of 2 to 3 in. dense globular heads of spikelets, 1 in. in diameter; internodes dull grey-green, striate, somewhat hirsute. *Spikelets* ·3 to ·4 in. long by ·1 in. broad, ovate, acute, minutely pubescent; *empty glumes* 2, ovate, blunt; fertile flowers 2 to 3; *flowering glumes* ovate, acute, the uppermost mucronate, with many veins and frequent transverse veinlets; *palea* of lower flowers 2-keeled, acute, ciliate on the keels, hardly veined between, that of upper flower not at all, or only slightly, keeled, ciliate at tip. *Stamens* little exserted; *anthers* long, ending in a penicillate point. *Ovary* narrowly ovoid, acuminate, hairy, surmounted by a hairy *style* and ending in a twisted plumose *stigma*. *Caryopsis* not known. *Brandis For. Flora* 570.

Khasia and Jaintea Hills in Assam, 2,000 to 5,000 feet, extending to the Bhamo District in Upper Burma. In the Khasia Hills it has been collected by Hooker and Thomson, and by G. Mann.

In Assam, this species is locally known as *Seiat, ussey, sejsai, sijong, denga, ukotang* G. Mann says it is cultivated in villages and used for building and basket-work-purposes. Specimens in flower were also collected by E. E. Fernandez near Naini Tál in Kumaun, in cultivated clumps, the seed of which was said to have come from Nepaul. This was in 1881, while Hooker's flowering specimens from the Khasia Hills were obtained in 1850. The Bhamo specimens, named *Kawa ule* (Kachin), were sent by J. W. Oliver, Conservator of Forests. It was also collected by J. L. Lister in 1875 in the Dikrung Valley, Daphla Hills, at 2,000 to 3,000 feet, who says that it is the large one of the country and used for 'chungas' or water-buckets. It is also cultivated in the Royal Botanic Garden, Calcutta, (No. 28). I also identify with this species the Sikkim bamboo known as *Patu* (Lepcha), *Tili bans* (Nepalese) collected by myself and Mr. G. A. Gammie, and this identification is also supported by Munro's note on specimens of *Patu* collected by T. Anderson. This species is difficult to distinguish from *D. Hamiltonii* when in leaf, but its more hairy sheaths and shorter leaf ligules separate it from that species. These, on the other hand, resemble those of *D. sikkimensis*, though the leaves and flowers are quite distinct. It is chiefly recognizable by the very hairy sheath and narrow acute spikelets.

Plate No. 73.—*Dendrocalamus Hookeri*, Munro. 1, leaf-branch; 2, part of flowering, panicle—*of natural size*; 3, sheath from lower part of stem; 4, sheath from upper part—*reduced*; 5, spikelet; 6, palea of lower flowers; 7, palea of upper flower; 8, anther; 9, ovary and style—*enlarged.* (Nos. 1 to 3 from Hooker's Khasia Hills specimens; No. 4 from Mann's; Nos. 5 to 9 from Fernandez's specimens.)

7. Dendrocalamus Hamiltonii, *Nees and Arn.*

A large bamboo with cæspitose culms; sometimes growing tall and erect, but more often sending out its stems at an angle or curved downwards. *Culms* large, 40 to 60 and even up to 80 ft. high, usually naked below, much-branched above; 4 to 7 in. in diameter, greyish-white when young, with dense appressed pubescence, dull green when old; nodes marked with root-scars; internodes 12 to 20 in. long, walls

·5 in. thick; *culm-sheaths* long and stiff, variable in size, those of lower part of large stems 16 to 18 in. long, about 8 in. broad, glabrous, shining within, rough and either glabrous or with scanty patches of brown stiff appressed hairs without, truncate at top, and furnished on either side with a small glabrous triangular point; *imperfect blade* about $\frac{3}{4}$ as broad at the base as the top of the sheath, often 12 in. long, narrow, ovate-lanceolate, sides incurved, glabrous without, but with many thick black sharp hairs at the base within; *ligule* ·2 in. broad, smooth, entire. *Leaves* variable, small on side branches, but on new shoots reaching 15 in. long and 2·5 in. broad, usually unequal-sided, rounded at the base into a short thick petiole, above broadly lanceolate and cuspidate, acuminate at the tip which is scabrous and twisted, smooth above, rough beneath, finely serrate at the edges; main vein narrow, raised, secondary veins 6 to 17 pairs, fairly prominent, number on either side sometimes unequal, intermediate 5 to 7, having pellucid dots between which form cross bars resembling transverse veinlets when dry; *leaf-sheaths* glabrous above, furnished below with white appressed stiff hairs, somewhat keeled below the shining callus, produced at the mouth to meet the *ligule*, which is broad and usually elongate and obliquely truncate or jagged. *Inflorescence* a huge, much-branched panicle with many whorls of branchlets, bearing half-verticellate semi-globular heads of purple flowers, supported by rounded scarious bracts; rachis-joints 1 in. or less long, thick, fistular, scabrous and white-pruinose, especially below the swoollen nodes, furrowed on one side; heads variable, from ·5 in. up to 1·5 in. in diameter, spikelets chiefly fertile. *Spikelets* purple, oval, depressed, ·4 in. long, glabrous; *empty glumes* usually two, short, rounded, nerved; flowers 2 to 4, usually all fertile; *flowering glume* broad, orbicular, somewhat recurved, ciliate on the edges; *palea* of lower flowers as long as flowering glumes, 2-keeled, ciliate on the keels and bifid at the acute apex, 2-nerved on the back, that of last flower not keeled, hairy at the acute apex only, many-nerved. *Stamens* long, exserted, pendulous; *anthers* purple, the connective produced into a long, black, hairy, twisted point. *Ovary* sub-orbicular, hairy, with a long hairy *style* and trifid plumose *stigma*. *Caryopsis* broadly ovoid, rounded at the base, beaked with the indurated style, hairy or glabrous above, glabrous below, embryo visible. *Munro in Trans. Linn. Soc.* xxvi. 151; *Brandis For. Flora* 570. BAMBUSA MONOGYNA, *Griffith Notulæ*, p. 63, *Icon.* 2, BAMBUSA MAXIMA, *Buch.-Ham. in Wall. Cat.* 5039. BAMBUSA FALCONERI, *Munro in Trans. Linn. Soc.* xxvi. 95 (part).

North-East Himalaya, Assam Valley, Khasia Hills, Sylhet, extending eastwards to Upper Burma, and westwards to the Sutlej, though doubtfully indigenous beyond Nepal.

This is the common bamboo of the Darjeeling Hills and Terai, of the Duars and the Assam Valley, and is in universal employment for building and basket and mat work, though as a building bamboo its comparative softness and thin walls make it inferior to such species as *Bambusa Tulda* and *Balcooa*. It is largely grown in Dehra Dún, and is met with here and there in the hills of Garhwal and Jaunsar, but always near villages and never in forest, so it can hardly be indigenous. J. W. Oliver says that it is 'common along banks of streams in evergreen and moist forest' in Katha and Bhamo, where it is locally known as '*Wabo-myetsangyè*' (Burm.) Abdul Huk, collector, has sent it from the Ruby Mines. In the Dehra Dún and Lower North-West Himalaya it is called *Chye*. In Darjeeling it is known by the names of *Tama* (Nep.) and *Pao* (Lepcha); in Assam as *Kokwa* and *Pecha* (Bengali), *Fonay* (Mikir), and *Wanoke* (Garo). The young shoots are eaten as a vegetable. The inner layer of the

culm-sheath is used for covering Burmese cigarettes. This bamboo flowers usually sporadically, so that clumps in flower may almost always be found; and consequently it has been largely and often collected: at the same time, like other species, it sometimes flowers gregariously as it is doing this year (1894) both in Sikkim and in Dehra Dún. Of its straggling habit, so noticeable in the forests of Bengal and Burma, but curiously much less so in the Dún, J. W. Oliver remarks, "When they have no trees to support them, the main stems bend over, forming impenetrable thickets, and the lateral branches ascend vertically, often forming shoots nearly as long as the main stems."

This species is very easily identified by its panicles of bright purple-red flowers; and when out of flower the grey stems, long nearly glabrous stem sheaths and straggling habit cause it to be easily recognized. The long hairy points to the anthers are also remarkable.

PLATE No. 74.—*Dendrocalamus Hamiltonii,* Nees. and Arn. 1, leaf-branch; 2, part of flowering panicle—*of natural size;* 3, stem-sheath—*reduced;* 4, spikelet; 5, flowering glume; 6, palea of lower flowers; 7, palea of uppermost flower; 8, anther; 9, ovary and style with trifid stigma; 10, the same, older; 11, caryopsis; 12, leaf-sheath—*all enlarged, No.* 4 *many times.* (All from my own Sikkim specimens.)

VAR. *β. edulis,* Munro, is a well-marked variety distinguished by the larger, more fistular internodes to the panicle, much larger and more congested, often long-bracteate heads, spikelets with more numerous flowers and bigger and broader leaves. It is common in the Darjeeling Hills, and is distinguished from the type by the natives, who call it *Yim-yot-pao* (Lepcha). The Lepcha *Ragvet* is also probably this variety; it has shorter ligules to its leaves than the type.

7. DENDROCALAMUS PATELLARIS, *n. sp. Gamble.*

A rather soft, evergreen, cæspitose bamboo. *Culms* 20 to 30 ft. high, 1 to 1·5 in. in diameter, dull green, striate; nodes marked by a projecting, softly hairy ring often ·3 in. deep and ·2 in. thick; internodes 12 to 18 in. long, whitish beneath the nodes, walls thin, fistular. *Culm-sheaths* long persistent, 10 to 12 in. long, 3 in. broad at base, prominently striate, sparsely covered with appressed brown stiff hairs outside, glabrous within; attenuate in the upper third only to a truncate top, ·7 to 1 in. broad, the top and the margin for 1 to 2 in. down furnished with a membranous, fimbriate, pale fringe which is ·3 to ·4 in. broad; *imperfect blade* lanceolate, 6 in. long, 1 in. broad, usually recurved; *ligule* conspicuous, fringed like the sheath. *Leaves* soft, variable, 8 to 16 in. long, 1 to 4 in. broad, unequally narrowed at the base into a ·2 in. petiole, ending above in a twisted scabrous point; smooth above, slightly rough below, minutely scabrous on the edges; main vein thick prominent, secondary veins 8 to 10, intermediate 7; *leaf-sheaths* striate, keeled at back, truncate or produced at top into a narrow callus, fringed or ciliate at the edges; *ligule* very long and broad, deeply long-fimbriately fringed. *Inflorescence* a huge compound panicle with spicate branches bearing distant distichous heads, the heads ·5 to 1 in. in diameter, supported by hard, shining bracts and containing many spikelets; *rachis* dull greenish-brown, rough, fistular, joints flattened on one side. *Spikelets* dark brown, depressed, blunt, ·4 in. long by as much

broad; *empty glumes* 1 to 2, short, rounded, many-nerved, membranous; flowers 3 to 5, usually all fertile; *flowering glumes* broad, orbicular, cuspidate, ciliate on the edges and densely tomentose within, 9- to 11-nerved; *palea* much shorter, ovate-lanceolate, acute or bi-mucronate, ciliate on the keels and 2-nerved between, densely tomentose within; terminal flower followed by a bristle-like rachilla, with a minute rudiment of a flower. *Lodicules* 0 to 2, narrow linear-lanceolate, long-ciliate, generally absent. *Stamens* exserted; *anthers* purple, the connective produced into a short, conical, hairy point. *Ovary* ovate from a broad base, hairy above, produced into a hairy *style* bearing three short plumose *stigmas*. *Caryopsis* (immature) rounded, shining, hairy above, dull and cuneate below, pericarp easily separable. BAMBUSA PATELLARIS, *Kurz MS. in Calcutta Bot. Garden Herbarium.*

North-East Himalaya and hills of Assam, ascending to 5,000 ft. Collected by Kurz, T. Anderson, G. A. Gammie, myself and others in the Darjeeling hills in leaf only, and by Sri Gopal Banerjee, in July 1890, in flower at Rangma Parbat, Naga Hills, for G. Mann. The chief Darjeeling locality is the Simonbong ridge below Tonglo at 4,000 ft.

This remarkable species, distinguished at once by the curious ring at the nodes and the fringes of the culm-sheath, has long been known in the Darjeeling hills by the name *Pagjiok*, *pagjiok-pao* (Lepcha), but in leaf only. The flowering specimens now received are said by G. Mann to be doubtful, as he identifies them with *Dendrocalamus Hamiltonii.* But I find that they do not entirely agree with those of that common and well-known species, for the flowering glumes and paleæ are very hairy inside, the anther tips are not nearly so long, there are lodicules occasionally present, and there is a terminal free rachilla; so that I consider I am justified in assuming that Babu Sri Gopal Banerjee did get his leaves and his flowers off the same clump, and that until further specimens come to hand, those sent by him should be considered as belonging to this species.

This bamboo is well worth cultivation for its handsome appearance, and it might even be hardy in some parts of Europe. In the Naga Hills it is used for basket-work, and known by the name *Footoong* (Mikir).

PLATE No. 75.—*Dendrocalamus patellaris*, Gamble. 1, leaf-branch; 2, flowering branch; 3, culm-sheath—*of natural size;* 4, spikelet; 5, flowering glume; 6, palea; 7, lodicules; 8, anther; 9, ovary and stigmas; 10, caryopsis (immature)—*enlarged.* (Nos. 1 and 3 from my own Sikkim specimens; the rest from G. Mann's.)

SECTION III.

8. DENDROCALAMUS GIGANTEUS, *Munro in Trans. Linn. Soc.* xxvi. 150.

A gigantic bamboo, with close cæspitose culms and slender branches. *Culms* very large though thin-walled, 80 to 100 ft. long, usually naked below and branched above, 8 to 10 in. in diameter, grey-green, covered with white waxy scurf when young; internodes rather short, 15 to 16 in.; nodes hairy beneath and marked with root scars; walls thin. *Culm-sheaths* very large, about 20 in. long by 20 in. broad at base, early deciduous, hard, glabrous, shining within, dull yellow without and thinly covered with golden stiff hairs, rounded at the top and often much depressed; *imperfect blade* 5 to 15 in. long, up to 3½ in. broad, usually recurved, the edges waved and often involute,

the base decurrent into glabrous, stiff, brown, wavy auricles which do not reach the edge of the sheath, narrowed upwards into a sharp point; *ligule* stiff, black, ·3 to ·6 in. broad, serrate on the edge, 2 to 5 in. long. *Leaves* variable in size, in young shoots they may reach 20 in. long by 4 in. broad, oblong, suddenly acuminate, unequal-sided, glabrous above, hairy beneath when young, edges scabrous, point sharp twisted; main vein prominent, secondary veins 12 to 16 pairs, furnished with pellucid dots, bars having the appearance of transverse veinlets apparent in dry specimens; *leaf-sheaths* striate, glabrous, ending in a callus which is sometimes shining and conspicuous, mouth produced upwards to meet the ligule; *ligule* broad, fimbriate, sometimes cleft in the middle. *Inflorescence* a huge panicle with long slender curved branchlets, bearing lax heads of few spikelets, sometimes only flower-bearing, sometimes leafy at top; heads up to 1 in. in diameter, rachis joints ·5 to 1 in. or more, slender, hairy below, white-scurfy above, often curved, furrowed on one side. *Spikelets* ·5 to ·6 in. long by ·3 in. broad, minutely pubescent, somewhat flattened, ovate, acute, spiny, many-flowered; *empty glumes* 1 to 2, ovate, mucronate, striate; flowers 3 to 6, all fertile except the last, which consists of an involute, elongate, mucronate glume; *flowering glumes* thin, papery, striate, many-nerved, mucronate, minutely hairy; *paleæ* of lower flowers blunt, of upper ones acute, bifid at the apex, those of the lower flowers 2-keeled, ciliate on the keels, 2- to 3-veined between them, that of the last fertile flower not usually keeled, glabrous. *Stamens* with long filaments; *anthers* ·3 to ·4 in. long, acuminate at the tip. *Ovary* ovoid, hairy, *style* long, hairy, ending in a feathery purple *stigma*. *Caryopsis* oblong, about ·3 in. long, obtuse, hairy above. *Kurz in Ind. Forester* i. 346. BAMBUSA GIGANTEA, *Wall. Cat. Bot. Gard. Calc.* p. 79; *Voigt Hort. Sub. Calc.* 719.

Malay Peninsula in Penang and northwards to Tenasserim, according to Munro, though Kurz doubts it; much cultivated in Burma and in the gardens of Calcutta, Madras, Peradeniya in Ceylon, and elsewhere; also in the Palm-house at Kew. Specimens were gathered by D. Brandis at Makúm in Assam in 1879 from cultivated plants. It was also collected at St. Helena by Mr. D. D. Morris.

This species is probably the giant of the bamboo tribe, and is at once recognized by its size, its characteristic sheaths, and the long whip-like spikes of the panicle, with long spikelets, acuminate anthers, and bifid palea. Good pictures of a magnificent specimen in the Royal Botanic Gardens at Peradeniya, Ceylon, with its young shoots appeared in the *Gardener's Chronicle* for 10th September 1892. In Burma it is known as '*Wabo*' (the '*Wa-ya*' referred to this by Munro is, Brandis informs me, *D. longispathus*, Kurz). An account of the plantations at Myanoung on the Irawadi is given in Ind. Forester ii. 311, where it is said that the plantations have 15 to 20 clumps per acre and that good culms fetch Rs. 1-4 each. The Assam name is *Worra*. It flowered in the Calcutta Botanic Garden in 1860-61 and again in 1888; in Burma in 1892, whence it was sent by W. T. McHarg from Tenasserim and by Abdul Huq from the Shan Hills; also in 1893 by H. Jackson from the Myelat in the Southern Shan States.

PLATE No. 76.—*Dendrocalamus giganteus*, Munro. 1, leaf-branch; 2, leaf from end branchlet or shoots; 3, part of flowering panicle—*of natural size;* 4, culm-sheath—*reduced;* 5, spikelet; 6, palea of lower flowers and anthers; 7, palea of upper flower; 8, anther; 9, ovary and style; 10, caryopsis—*enlarged.* (Nos. 1 to 4 from a drawing in the Herbarium of the late S. Kurz; rest from specimens collected in the Calcutta Royal Botanic Garden, 1888.)

9. DENDROCALAMUS CALOSTACHYUS, *Kurz For. Fl. Burma* ii. 562.

A tufted bamboo. *Culms* with appressed silvery hairs, thickened and annulate at the nodes. *Culm-sheaths* covered with appressed tawny hairs, truncate at the mouth; *ligule* narrow, entire, or nearly so. *Leaves* large, those of the end branches broadly lanceolate acuminate; rounded at the base into a very short petiole; 9 in. to 1 ft. long by 1 to 2·5 in. broad, those of side shoots shorter, smooth and glabrous above, softly hairy beneath, scabrous on the edges; secondary veins 9 to 13 on either side, faint; *leaf-sheaths* striate, long white-ciliate at the edges, ending in a small callus below the petiole and truncate at the mouth; *ligule* broad, truncate, entire or shortly serrate. *Inflorescence* a large panicle of long, whip-like, curved spikes; spikelets clustered in heads of 2 to 5 with a few small empty bracts at base; rachis between the heads 0·5 to 2 in. long, flattened on one side on alternate sides, glaucous, somewhat puberulous. *Spikelets* ·4 to ·6 long by ·2 in. broad, faintly pubescent, ovate, acute, slightly compressed, with 4 to 6 fertile flowers; *empty glumes* 2 to 3, broadly ovate, acute, many-nerved and with conspicuous transverse veinlets, ciliate on the edges; *flowering glumes* similar but rather longer; *palea* of lower flowers keeled, acute, 5-nerved between the keels and transversely veined, 1-nerved on either side of keel, ciliate on the keels, that of uppermost flower ciliate on the edges, but not on the keels. *Stamens* exserted; *anthers* yellow, smoothly mucronate. *Ovary* ovate, rounded, sub-hemispheric, hairy, ending in a long hairy *style* with a simple fringed *stigma*. BAMBUSA CALOSTACHYA, *Kurz in Journal As. Soc. Beng.* xlii. 249 (1873).

Upper Burma, Bhamo and Kachin Hills at 3,500 feet elevation and below, collected by Dr. John Anderson at Poneshee and Bhamo in 1868, and on the Yunan Expedition in 1875.

Recognized by its long flagellate spikes and clusters with few spikelets, resembling most the inflorescence of *D. giganteus*. Kurz says that there are lodicules, but I have not found them.

PLATE No. 77.—*Dendrocalamus calostachyus*, Kurz. 1, leaf-branch; 2, part of panicle —*of natural size;* 3, spikelet; 4 & 5, paleæ of lower and uppermost flowers; 6, anther; 7, ovary and style—*enlarged.* (From Dr. Anderson's specimens).

10. DENDROCALAMUS LONGISPATHUS, *Kurz For. Fl. Burma* ii. 561.

A large bamboo with cæspitose culms, reaching 60 ft. in height, leaves borne only on upper branches. *Culms* glaucous-green when young, greyish-green when old, covered with more or less persistent sheaths, as long, or even longer than, the internodes; nodes little swollen, often rooting; internodes 10 to 24 in. long, 3 to 4 in. in diameter, walls ·5 in. thick. *Culm-sheaths* papery, 15 to 20 in. long, 5 to 7 in. broad, sides parallel till near the top where they are gradually approximate and embrace a depressed sinus on which the recurved imperfect blade is inserted; sometimes with a round naked auricle on one side; densely clothed on the back with patches of stiff appressed brown hairs; *imperfect blade* lanceolate-acuminate, recurved, 12 to 18 in. long by 1 to 1·5 in. broad at the broadest point a little above the insertion, densely hairy on the back and near the base beneath; *ligule* broad, much serrate or often long-fimbriate. *Leaves* oblong-lanceolate to linear-lanceolate, acuminate, narrowed at the base into a very short petiole; glabrous above, rough and glaucescent or sometimes almost white beneath, edge

scabrous; main vein thick, prominent, yellow, shining beneath, secondary veins 8 to 10 on either side, not prominent, intermediate 6 to 7; *leaf-sheaths* smooth, glabrous, somewhat produced at the mouth, and sometimes bearing a rounded naked auricle on one side; *ligule* narrow, usually fringed. *Inflorescence* a large panicle of interruptedly spicate clusters of spikelets, sometimes leafy; rachis flexuose, flattened on alternate sides, ·5 to 1·5 in. between clusters, glaucous-green, sometimes rough. *Spikelets* in heads sometimes few-flowered and ·2 to ·3 in. broad, supported by hard polished bracts, sometimes many-flowered and ·5 to ·7 in. broad; blunt, nearly glabrous, ·2 to ·3 in. long; *empty glumes* 2 to 3, obovate, blunt, with short rachillæ between; flowers 2 to 3, fertile; *flowering glume* blunt, obovate, cucullate, ciliate on the edges, many-nerved; *palea* oval, truncate, faintly keeled, 2-nerved between the keels, faintly pubescent. *Stamens* short; *anther* yellow, short, ending in a black mucronate point; *filaments* short. *Ovary* broadly ovoid, somewhat acute, hairy, ending in a rather short *style* and short purple *stigma*. *Caryopsis* ovoid, somewhat oblique, yellow, surmounted by a beak formed by the base of the style. BAMBUSA LONGISPATHA, *Kurz in Journal As. Soc. Beng.* xlii. 249.

Eastern Bengal and Burma, chiefly along streams. Sent from Sylhet by G. Mann in 1889; collected in Chittagong by J. L. Lister, 1876, by myself in 1879 and 1880, and by R. Ellis in 1885; in Arracan by W. Schlich; and in Burma by Brandis (1862); Kurz (1871); P. J. Carter (1891) and others.

This handsome species is at once recognized by its long fragile papery sheaths and by the large panicles of small flower heads and blunt spikelets. It comes nearest to *D. Hamiltonii* in its general characters, but is easily recognized therefrom. It flowered in Chittagong in 1876 (Lister) and 1879-80 (Gamble) and in Burma in 1871 (Kurz) and 1891 (Carter). It is known locally by the names *Khang* (Bengali), *Ora* (Arracanese) and *Wa-ya* and *Talagu* (Burmese), the name '*Wa-ya*' meaning 'stinging bamboo,' for the hairs on the sheaths are especially irritating. It has been introduced into the Western Peninsula and cultivated at Calcutta, in Malabar, etc., but the culms are not very strong, and as a building material it is generally inferior to many other kinds.

PLATE No. 78.—*Dendrocalamus longispathus*, Kurz. 1, leaf-branch; 2, part of flower-panicle—*of natural size;* 3, culm-sheath—*reduced* $\frac{1}{2}$; 4, spikelet; 5, flower opened out; 6, palea; 7, anther; 8, ovary and style; 9, caryopsis—*enlarged.* (All from Kurz' Burma specimens.)

11. DENDROCALAMUS BRANDISII, *Kurz For. Fl. Burma* ii. 560.

A large, evergreen, tufted bamboo. *Culms* ashy-grey to greenish-grey, 60 to 120 ft. high, 5 to 8 in. in diameter, slightly branched below, more so above; nodes slightly swollen, lower ones with rootlets; *internodes* 12 to 15 in. long, walls thick. *Culm-sheaths* like those of *D. giganteus*, thick, coriaceous, up to 2 ft. long, 12 to 14 in. broad, minutely white pubescent on the back, otherwise glabrous, rounded depressed at top; *imperfect blade* linear-lanceolate, 6 to 18 in. long, 3 to 5 in. broad, recurved, appressed-hairy within, rounded at the base and again decurrent on the sheath in small plaited auricles which do not reach its edge; *ligule* ·5 to ·7 in. broad, deeply lacerate. *Leaves* oblong-lanceolate, 9 to 12 in. long, 1 to 2 in. broad, somewhat narrowed at the base and decurrent on a short wrinkled petiole; ending above in a subulate twisted point; glabrous above, softly hairy beneath; main vein thick, shining, secondary veins 10 to 12, intermediate

about 6, the pellucid glands forming apparently transverse veinlets; *leaf-sheaths* striate, pubescent when young, ending in a large glabrous callus, and produced at the mouth where furnished with few long deciduous ciliæ; *ligule* long, conspicuous in young branches, acuminate, fimbriate especially on one side, in older ones truncate. *Inflorescence* a huge, much-branched panicle, with long, spicate, flagelliform branches, bearing bracteate heads ·5 to ·7 in. in diameter, of many small spikelets, the ends of the branches bearing only lanceolate bracts; *rachis* densely pubescent, flattened on one side, segments 1 to 1·5 in. long. *Spikelets* ·2 to ·3 in long, nearly as broad, ovate, depressed, minutely pubescent; *empty glumes* 1 to 2, broadly ovate, mucronate, nearly glabrous; flowers 2 to 4; *flowering glume* similar, prominently few-nerved, ciliate on the edges, hairy near the tip; *palea* oblong, acute or bi-mucronate, ciliate on the keels, side wings narrow, membranous, 3-nerved. *Lodicules* 1 or 2, lanceolate or spathulate, 3-nerved, long-ciliate, often wanting. *Stamens* exserted; *anthers* greenish-yellow, short, broad, apiculate or penicillate; *filaments* short, thick at first. *Ovary* ellipsoid, hairy; *style* short, ending in a thick club-shaped plumose *stigma*, or dividing into two plumose stigmas; stigmas purple. *Caryopsis* ovoid, ·1 to ·2 in., hairy above, tipped with the persistent style, pericarp crustaceous. BAMBUSA BRANDISII, *Munro in Trans. Linn. Soc.* xxvi. 109.

Tropical forests of the eastern slopes of the Pegu Yoma and of the Martaban hills up to 4,000 ft., extending northwards to the Ruby Mines district, chiefly on calcareous rocks. Collected by Brandis in 1862, by Kurz in 1871 and by J. W. Oliver in 1890 and 1894 (on the Mogôk road, Ruby Mines district, 3,000 ft.)

This splendid bamboo is often confused with the somewhat similar *D. giganteus* and, like it, is sometimes called *Wabo* (Burmese). It is also known as *Kyellowa*, *waya*, *wapyu* (Burmese), *Wakay* (Karen). It is easily recognized from *D. giganteus* by the much smaller spikelets, and culms which, though not so large in diameter, have thicker walls. The culm-sheaths are very similar. It so much resembles *D. flagellifer* that I am of opinion that the two may prove eventually to be one species. *D. Brandisii* has fewer spikelets in the heads and a rather more hairy rachis, with the leaves more rounded at the base, otherwise I find no difference. Munro, who noticed the similarity, says *D. flagellifer* has no lodicules, but I have found them, although they certainly are not common. J. W. Oliver says it is used for building. It is said to flower sporadically and not to die off after flowering; but Oliver says that flowering clumps which he has observed showed every appearance of being about to die.

PLATE No. 79.—*Dendrocalamus Brandisii*, Kurz. 1, leaf-branch; 2, part of flower-panicle—*of natural size*; 3, culm-sheaths—*much reduced*; 4 & 5, leaf-sheaths and ligules; 6, spikelet; 7, flowering glume; 8, palea; 9 & 10, lodicules; 11, anther; 12, ovary and stigmas; 13, caryopsis—*enlarged* (Nos. 3 and 4 from J. W. Oliver's specimen; rest from Kurz' specimens.)

11. DENDROCALAMUS FLAGELLIFER, *Munro in Trans. Linn. Soc.* xxvi. 150.

A tall bamboo. *Culms* tall; internodes of young stems farinose. *Leaves* large, oblong-acuminate, 10 to 14 in. long, 1·5 to 2·3 in. broad, glabrous above, except the minute scabrous teeth on the veins towards the margin, rough below, sometimes with long hairs on the midrib, edges scabrous; attenuate at the base into a ·2 to ·3 in. petiole which is sometimes scabrous-hirsute, ending above in a twisted scabrous point;

main vein prominent, secondary veins 11 to 13 pairs, conspicuous, pellucid glands appearing as transverse veinlets numerous; *leaf-sheaths* striate, white-hairy in the middle, glabrous above, truncate, naked at the mouth, fimbriate on one edge; *ligule* short, conspicuous, truncate, serrate. *Inflorescence* a large panicle; rachis usually very scabrous at the top, hirsute on one side where flattened; branches numerous from the nodes, elongate, whip-like, pendulous with small distant verticils which are scarcely more than ·4 to ·5 in. broad and bear few spikelets, the uppermost joints with leafy bracts only. *Spikelet* short, ovate, ·2 to ·3 in. long, with 4 to 5 fertile flowers; *empty glumes* very small, ovate, mucronate, many-nerved; *flowering glume* ovate, mucronate, glabrous above or rarely slightly scabrous, shortly ciliate on the edges, many-nerved; *palea* obtuse or acute or mucronate, membranous, ciliate on the keels and edges, 1- to 2-nerved between the keels. *Lodicules* none, or 1 to 2, scarce, spathulate-lanceolate, fimbriate. *Stamens* exserted, *anthers* apiculate with a bristle or with a few short hairs. *Ovary* ovoid, small, hairy; *style* hairy, deeply cleft into 2 to 3 plumose *stigmas*. BAMBUSA FLAGELLIFERA, *Griffith MS.* BAMBUSA BITUNG *Röm. and Schultes Syst. Veg. Mant.* 1354 (probably, according to Munro).

Malay Peninsula, extending northwards to Tenasserim, where Beddome collected it on Moolyet at 2,000 ft. in 1879.

A little known species which requires investigation and better specimens. It is at once known by the very small spikelets, and is perhaps identical with *D. Brandisii.* Specimens collected at Singapore by H. M. Ridley bear the names *Buluk Butung, butang perith.*

PLATE No. 80.—*Dendrocalamus flagellifer*, Munro. 1, leaf-branch; 2, part of flower-panicle—*of natural size*; 3, spikelet; 4, flowering glume; 5, palea, both sides; 6, lodicule; 7, anther; 8, ovary and stigmas—*enlarged.* (All from H. N. Ridley's specimen).

13. DENDROCALAMUS LONGIFIMBRIATUS, *n. sp. Gamble.*

A large bamboo. *Culms* and *culm-sheaths* unknown. *Leaves* very large, 12 to 14 in. long, 2 to 3 in. broad, oblong-acuminate, unequal at the base and rounded into a ·4 to ·5 in. long, broad, wrinkled petiole, tip twisted, scabrous, acuminate; smooth above, except the scabrous points on marginal veins; pale and smooth beneath, hairs along the midrib somewhat long, edges sometimes scabrous; main vein broad at the base, concave, not prominent, secondary veins 12 to 18 pairs, regular, intermediate 6 to 7, indistinct, pellucid glands appearing as transverse veinlets when dry; *leaf-sheaths* shining, covered with appressed stiff hairs ending in a narrow callus, and furnished with long, very prominent, falcate auricles which are thickly set with stiff curved bristles; *ligule* short, very hairy, ciliate on the margin. *Inflorescence* a large panicle of short spicate branchlets bearing small heads of spikelets; rachis slender, glabrous, flexuose; branchlets solid; heads (in bud only) ·2 to ·3 in. in diameter supported by blunt, ovate bracts. *Spikelets* very small, glabrous, 1- to 2-flowered; *empty glumes* broadly ovate, striate, *flowering glume* ovate, acute, keeled, often mucronate; *palea* oblong, ciliate on the keels; *lodicules* apparently none. *Anthers* short, connective shortly apiculate. *Ovary* ovoid, glabrous, surmounted by a hairy *style* and plumose *stigma. Caryopsis* not known.

Burma, sent from the Kyaukshat and Maliwón forests at the extreme south of the Mergui District, Tenasserim, in 1891.

The flowers are too young for very accurate description, but they come near to those of *D. longispathus*. The beautiful long-fringed falcate auricles characterise best this fine species which is known locally as *Myengwa*, *wapyau* (Burmese).

PLATE No. 81.—*Dendrocalamus longifimbriatus*, Gamble. 1, leaf-branch; 2, part of flower-panicle—*of natural size;* 3, spikelet; 4, empty glume; 5 & 6, flowering glumes; 7, palea; 8, palea and stamens; 9, stamens and stigma; 10, ovary—*all enlarged.*

IMPERFECTLY KNOWN SPECIES.

14. DENDROCALAMUS PARISHII, *Munro in Trans. Linn. Soc.* xxvi. 149.

Culms, *culm-sheaths*, and *leaves* unknown. *Inflorescence* a panicle of interrupted globose densely-flowered heads, the rachis pruinose-glaucous at the top. *Spikelets* ovate, somewhat blunt, nearly glabrous, flattened, ·3 to ·4 in. long by ·2 to ·3 in. broad, fertile flowers 2 to 3; *empty glumes* 1 to 2, ovate-acute, many-nerved, ciliate on the edges and very minutely pubescent near the apex; *flowering glume* similar but glabrous, those of upper flowers mucronate, longitudinally and transversely nerved, ciliate on the edges; *palea* ovate, blunt, emarginate, 2-keeled, ciliate on the keels and edges, 2-nerved between them, that of uppermost flower more acute, not keeled, pubescent at the tip, reticulately veined. *Stamens* not exserted; *anthers* with the connective produced in an obtusely acute point. *Ovary* hairy, ovoid-globose, ending in a long *style* and feathery *stigma*. *Caryopsis* large, obovate, smooth above, beaked. *Brandis For. Fl.* 570.

Punjab Himalaya: collected once by Lieut. Parish, but not again.

The flowers are distinct from those of the *D. strictus* group, and come nearest to those of *D. Hookeri*, but differ in the glabrous flowering glume and bluntly acute anthers. It would be an excellent thing to obtain more specimens of this, and to ascertain its true position. The exact locality where this grows is apparently unknown. Brandis suggests that it may be the same as the big species of the Dún and Lower Hills; but that species, of which I have collected excellent specimens in leaf and flower, is *D. Hamiltonii*. It is more likely to have been a planted specimen of *D. Hookeri*, like the similarly planted specimens found by E. E. Fernandez near Naini Tál.

PLATE No. 82.—*Dendrocalamus Parishii*, Munro. 1, flowering branch—*of natural size;* 2, spikelet; 3, flowering glume; 4, palea; 5, ovary and style; 6, anther—*enlarged* (from Parish's specimen kindly lent by the Director, Royal Garden, Kew).

15. DENDROCALAMUS COLLETTIANUS *n. sp. Gamble.*

Culms, *culm-sheaths* and *leaves* known. *Inflorescence* a large compound panicle with spicate branchlets bearing heads of spikelets, the *heads* ·5 to 1 in. in diameter with 6 to 12 fertile spikelets and a few sterile spikelets and small ovate bracts; *rachis* flexuose, pubescent, striate, joints about 1 in. in length. *Spikelets* ·5 to ·7 in. long, white-pbbescent, soft; *empty glumes* 2, ovate-acute, pubescent outside, many-nerved, midrib thickened; fertile flowers 2 to 4 with 1 imperfect terminal flower; *flowering glume* ovate-lanceolate, shortly mucronate, pubescent, many-veined; *palea* longer than flowering glume, long-white-ciliate on the keels, blunt, 2-veined between the keels. *Lodicules* none. *Stamens* exserted, *anthers* rather short, bluntly apiculate. *Ovary* narrowly ovoid, stalked,

hairy, produced upwards into a narrow hairy *style* with club-shaped purple *stigma*. *Caryopsis* not known.

Upper Burma, collected at Fort Stedman by Abdul Huk for the Royal Botanic Gardens, Calcutta, in 1892.

Although only the flowers of this species are known, I have no hesitation in describing it here, as it is so distinct and so well characterised by the soft white-hairy spikelets. I have named it after General Sir H. Collett, K.C.B., who has done so much to make known the flora of Upper Burma.

PLATE No. 83.—*Dendrocalamus Collettianus*, Gamble. 1 and 2, flowering branches—*of natural size;* 3, spikelet; 4, empty glume; 5, flowering glume; 6, palea; 7, anthers; 8, ovary and style—*enlarged.*

Species of DENDROCALAMUS *now referred to other genera.*

D. Balcooa, Voigt	= *Bambusa Balcooa*, Roxb.
D. criticus, Kurz	= *Bambusa pallida*, Munro.
D. Griffithianus, Kurz . . .	= *Bambusa Griffithiana*, Munro.
D. monadelphus, Thw. . . .	= *Oxytenanthera Thwaitesii*, Munro.
D. Tulda, Voigt	= *Bambusa Tulda*, Roxb.

8. Melocalamus, *Benth.*

An arborescent bamboo of moderate size, unarmed. *Culms* from a thick rootstock, semi-scandent. *Culm-sheaths* cylindrical, hard, auricled. *Leaves* large, petiolate, without transverse veinlets. *Inflorescence* a large compound panicle, the spikelets in round congested heads in long spikes. *Spikelets* very small, 2-flowered, rachilla continuous between the flowers and produced beyond them, flowers both hermaphrodite, one only fertile. *Empty glumes* 2, broad, blunt, muticous, many-nerved. *Flowering glumes* similar to empty glumes. *Palea* as long as flowering glume, very broad, 2-keeled, membranaceous. *Lodicules* 3, large. *Stamens* 6, filaments free, anthers blunt. *Ovary* glabrous, with short style and 2 to 3 plumose stigmas. *Caryopsis* very large, globose, depressed, with a tough pericarp and large, free, fleshy seed.

Distrib.—One species.

1. MELOCALAMUS COMPACTIFLORUS, *Bth. and Hook. f. in Gen. Pl.* iii. 1212.

An evergreen, tufted, arborescent bamboo. *Culms* greyish-green, rough, scandent, spreading and arching, 15 to 25 ft. high or more, sometimes even up to 100 ft. and climbing over tall trees, 0·5 to 1 in. in diameter; nodes thickened; internodes 14 to 24 in. long. *Culm-sheaths* persistent, hard, brittle, cylindrical, smooth or covered with white appressed hairs, truncate at the mouth, dilated at the base, about 6 in. long by 3 in. broad; *imperfect blade* nearly as long as, or longer than, the sheath, recurved, long-acuminate, rounded at the base and then spreading out into a narrow, dark, reflexed, crescent-shaped auricle, fringed with stiff bristles, hispidly hairy towards the base; *ligule* narrow, entire. *Leaves* large, oblong-lanceolate, rounded at the base into a hairy petiole ·1 to ·2 in. long; ending in a subulate, acuminate, penicillate, scabrous twisted point, scabrous on one edge; 6 to 10 in. long by 1 to 2 in. broad; main vein narrow, prominient, secondary veins 8 to 12 pairs, intermediate 4 to 6, no transverse

veinlets; *leaf-sheath* striate, with appressed white hairs when young, afterwards glabrous, somewhat keeled, mouth truncate, furnished with a lunate reflexed auricle fringed with stiff bristles, and early caducous; *ligule* narrow, entire. *Inflorescence* a large compound interrupted panicle of small sub-globose heads, bearing several fertile and many sterile spikelets, often leaf-bearing; the rachis very pubescent, flexuose, flattened on one side, ·5 to 1·5 in. in length; heads ·3 to ·5 in. in diameter. *Spikelets* very small, ·1 to ·15 in. long, ·1 in. broad, glabrous, blunt or truncate, 2-cleft, with 2 fertile flowers and 1 empty terminal abortive flower on a produced rachilla; *empty glumes* 2, broadly oval, ventricose, very shortly mucronate; *flowering glume* similar, often ciliate on the edges; *palea* as long as the flowering glume, broadly boat-shaped, shortly and bluntly 2-toothed, 2-keeled, ciliate on the keels and 4- to 5-nerved between. *Lodicules* 3, large, ovate, blunt, long-ciliate. *Stamens* free, filaments short; *anthers* yellowish, bluntly acute at the tip. *Ovary* glabrous, ovoid-globose, surmounted by a short thick *style*; *stigmas* 2 or 3, short, plumose. *Caryopsis* large, sub-globular, 1 to 1·5 in. in diameter, the summit depressed, the base supported by the persistent glumes, at first glossy-green, then brown; pericarp about ·05 to ·1 in. thick, very coriaceous; seed large, fleshy. PSEUDOSTACHYUM COMPACTIFLORUM, *Kurz For. Fl. Burma* ii. 567.

Eastern Bengal and Burma, from Sylhet through Chittagong down to Martaban, said by Kurz to occur rarely under 3,000 ft. in altitude, and to be frequent only between 4,000 and 6,000 ft. It has been collected in Sylhet in 1889 by Tara Kisor Gupta for G. Mann (leaves and sheaths only). It was also collected in Chittagong by Dr. W. Schlich in 1875, also in leaf only. In Burma, it was collected first of all in Martaban and in the Karen Hills by Kurz in 1871, in flower; and J. W. Oliver found it on the Arracan Yoma Range in the Thayetmyo District in 1878, and in the Ruby Mines District in 1894.

This interesting bamboo has the appearance of a *Dendrocalamus*, but differs in being scandent and having a very large seed and large lodicules. It seems to be a handsome species and to be common. In Burma it is known as *Wa-nwe*, in Chittagong as *Lota*, and in Sylhet as *Daral* (Bengali). It is there used for basket-work. There is a figure of flowers and fruit by Kurz in *Ind. Forester*, vol. i. 219, plate II, 13, which is attributed to this species by Bentham in the *Genera Plantarum*, and which has been utilized in my plate.

PLATE No. 84.—*Melocalamus compactiflorus*, Benth. and Hook. fil. 1, leaf-branch; 2, 2 (*a*), portions of flower-panicle; 3, young shoot showing culm-sheaths; 3, culm-sheath—*of natural size*; 4, auricle of leaf-sheath; 5, spikelet; 6, empty glume; 7, palea; 8, lodicule; 9, stamen; 10, ovary; 11, young fruit; 12, caryopsis—*enlarged*. (1 to 11 from Kurz' Burma specimens, 12 from Kurz' Plate II, 13 in "Bamboo and its use," *Indian Forester*, vol. i. 219.)

9. Pseudostachyum, *Munro.*

A large shrubby bamboo with single culms from a creeping rhizome. *Culms* smooth, thin-walled; *nodes* not swollen. *Culm-sheaths* shorter than internodes, truncate-triangular, imperfect blade long. *Leaves* large, glabrous, with many transverse veinlets. *Inflorescence* a large leafy panicle of drooping bracteate spikes, rachis wiry. *Spikelets* small, 1-flowered, with a terminal produced rachilla and abortive floret. *Empty glumes* usually only 1, broad, mucronate. *Flowering glume* similar to empty glumes. *Palea* thin, much convolute,

2-keeled. *Lodicules* large, 3 to 5, persistent. *Stamens* 6, anthers apiculate. *Ovary* glabrous, *style* rigid, long, *stigmas* 2. *Caryopsis* glabrous, depressed-globose, supported by the persistent glumes, palea and lodicules; pericarp crustaceous, separable from the seed.

Distrib.—One species.

1. Pseudostachyum polymorphum, *Munro in Trans. Linn. Soc.* xxvi. 142, *t.* 4.

A large shrub or semi-arborescent bamboo with culms arising singly from a long, creeping, jointed rhizome. *Culms* tall, branching at the top only, up to 50 ft. in height and often supported by adjoining trees, and so appearing scandent; nodes hardly swollen; internodes 7 to 12 in., glaucous at first, afterwards green, whitish below the nodes, sometimes dark red shading into bright green, smooth below, somewhat scabrous above, 1 in. in diameter, walls very thin, hardly ·2 in. *Culm-sheaths* shorter than the internodes, loose, triangular-truncate in outline, very shortly auricled with a tuft of stiff bristles, covered outside with appressed dark brown hairs; *imperfect blade* very long-acuminate on young shoots, shorter and triangular on older ones, the base equal to the horizontally-cut truncate top of the sheath, striate and with tranverse veinlets; *ligule* short, slightly dentate. *Leaves* oblong-lanceolate, unequal at the base and narrowed into a rather long, ·3 to ·5 in., thick petiole; above ending in a long twisted scabrous point; 4 to 14 in. long, 1 to 2 in. broad; smooth on both sides, scabrous on one edge; main vein pale, conspicuous; secondary veins 7 to 11, conspicuous; intermediate 5 to 6; transverse veinlets many, oblique; *leaf-sheaths* faintly white-pubescent when young, afterwards glabrous, striate, the mouth ending in a few stiff deciduous ciliæ; *ligule* short. *Inflorescence* a large leafy panicle, with many branches from the joints, much divided; the rachis curved, wiry, angled, spikelets solitary in the axils of narrow bracts. *Spikelets* small, ·2 in. long, with 1 fertile flower and a terminal produced rachilla bearing glumes, or an incomplete flower; *empty glume* 1, broad, mucronate, usually 7-nerved; *flowering glume* similar to empty glume, finely ciliate above; *palea* thin, much convolute, 2-keeled, ciliate on the keels; *lodicules* 3 to 5, usually 4, large, acute, rounded or truncate at the apex, ciliate, persistent in the fruit. *Stamens* free, *filaments* short, *anthers* apiculate. *Ovary* narrow, linear-oblong, ending in a long rigid style, with 2 short hairy stigmas. *Caryopsis* globose-depressed, surmounted by the base of the style and supported by the persistent glumes, palea and lodicules; pericarp crustaceous, separable. (The flower-bearing inflorescence is more often replaced by a large panicle of diseased flowers, in which the spikelets are converted into rounded softly hairy masses.)

Eastern Himalaya, Assam and Upper Burma; ascending in the hills to 5,000 feet, but most common in valleys in moist places under the shade of large trees; from the Darjeeling Terai eastwards through the Garo Hills and along the Assam Valley to Manipur and on to Bhamo. Collected in Sikkim by Hooker, Thomson, Kurz, T. Anderson, G. King, G. A. Gammie and myself; and in Assam by Masters, Jenkins, Brandis, G. Mann and others; in Manipur by C. B. Clarke, and near Bhamo by W. T. McHarg. The only specimens I have seen with perfect flowers are those of Thomson collected in 1857 and referred to and described by Munro; and of G. A. Gammie, collected in 1891. All the rest consist of the diseased state of the inflorescence (see fig. 3).

This very pretty bamboo is easily recognized by its very thin culms, its triangular sheaths, and the peculiar and very common diseased inflorescence. It is a valuable kind, for in Sikkim it is considered the best sort for making the basket-work used by the

natives and on the tea estates, as the culms are easily split and the laths are flexible and durable. Its recent discovery in Burma is due to W. T. McHarg, Deputy Conservator of Forests, who sent specimens through J. W. Oliver. Mr. McHarg says that it grows in the hills of the Bhamo district up to 1,000 feet and more, but is also to be found on the banks of the Irrawaddy in the Hakan Forest a few miles north of Bhamo. He further says—"It is principally used by the Kachin wizards or prophesying priests, "who roast the stem and then prophesy according to the way the bamboo cracks or "splits up. It is a very thin bamboo and splits easily, and the new shoots, which "are the ones used by the Kachins, grow up very straight." It is locally known in Sikkim by the names *Filing* (Nepalese) and *Purphiok* or *puphok* (Lepcha); in Assam as *Wachall* (Garo); *Bajal*, *tolli*, *nál* (Assamese); in Burma as *Bawa*.

Plate No. 85.—*Pseudostachyum polymorphum*, Munro. 1, leaf-branch; 2, part of fertile flowering branch; 3, branch bearing diseased flowers—*of natural size;* 4, culm-sheath —*much reduced;* 5, portion of flower spike; 6, 7 & 8, spikelet showing flowering glume, palea, stamens and stigmas; 9, ovary with style; 10 & 11, the same with lodicules; 12, young caryopsis; 13, caryopsis when ripe—*enlarged.* (All but Nos. 4 and 12 from Fitch's drawing, Munro l. c. t. 4.)

10. Teinostachyum, *Munro.*

Shrubby or arborescent bamboos. *Culms* rather thin, rough, straight below, drooping above. *Culm-sheaths* usually thin, auricled or not, *imperfect blade* recurved. *Leaves* various in size, like those of *Bambusa*, more usually lanceolate-acuminate. *Inflorescence* a spicate panicle, on leaf-bearing branches, the spikelets in bracteate verticils. *Spikelets* long, narrow, many-flowered, with imperfect flowers above and below. *Empty glumes* 1-2, ovate, mucronate. *Flowering glume* similar with longer mucros. *Palea* 2-keeled, ciliate on the keels, convolute. *Lodicules* 3, conspicuous, persistent, 3—9-nerved. *Stamens* 6, filaments free, slender; *anthers* exserted, obtuse, or obtusely apiculate. *Ovary* depressed-globose or ovate, the perigynium produced into a long beak enclosing the *style*, which is divided above into 2-3 short or long plumose *stigmas*. *Caryopsis* ovoid, acuminate, beaked, with a crustaceous pericarp.

(*Note.*—In the *Genera Plantarum* the spikelets are described as 1-flowered, Mr. Bentham having clearly determined to consider each flower as a spikelet. But I think that if the spikelet of the best known species—*T. Griffithii*—as depicted in the excellent Plate No. 3 in Munro's Monograph is examined, it will be seen to be truly many-flowered, just like the rather similar spikelets of many species of *Arundinaria*. Kurz considered that *Teinostachyum* should be joined with *Cephalostachyum*, but I prefer to retain the genera of the authors of the *Genera Plantarum*.)

Distrib.—Three species from the Assam-Burma region, one from the Western Gháts, and one from Ceylon.

Analysis of the species.

Culm- and leaf-sheaths long-auricled.
Spikelets over 1 in. long, lodicules glabrous . . . . 1. *T. Griffithii.*
Culm- and leaf-sheaths not, or hardly, auricled.
Spikelets in loose terminal drooping panicles, lodicules short, ciliate, leaves large 2. *T. Wightii.*

Spikelets in stiff terminal spikes.
Spikes simple, leaves small (Ceylon species) . . . . 3. *T. attenuatum.*
Spikes panicled, leaves moderate-sized (N. E. Indian and Burmese species) . 4. *T. Dullooa.*
Culm- and leaf-sheaths and ligules long-fringed . . . . 5. *T. Helferi.*

1. TEINOSTACHYUM GRIFFITHII, *Munro in Trans. Linn. Soc.* xxvi. 143, *tab.* 3.

A graceful, straggling or sub-scandent, bamboo. *Culms* erect at first, afterwards drooping, 25 to 50 feet long, verticillately branched from the nodes; internodes 18 to 26 in. long, ·6 to ·8 in. in diameter, scabrous above; walls thin, ·2 in. *Culm-sheaths* 6 in. or more long, 1·5 in. broad, glabrous and shining below, covered above with appressed white hairs, ciliate at the edges, strongly convolute; *imperfect blade* 3 to 4 in. long, reflexed, ovate-acuminate, rounded at base and prolonged into a large rounded auricle at either side, the auricle and base of the imperfect blade fringed with long, curved, reflexed bristles, the inside densely white-shaggy, transverse veinlets conspicuous; *ligule* short, pubescent. *Leaves* oblong-lanceolate, 6 to 10 in. long by ·7 to 1·5 in. broad, glaucous beneath; rounded at the base into a thick wrinkled petiole ·2 in. long; cuspidate above with a scabrous, subulate point; scabrous on both edges, glabrous on both sides except for clusters of long hairs at the base of the midrib; main vein conspicuous, pale, secondary veins 8 to 10 pairs, intermediate 7, thick, transverse veinlets none, but occasional pellucid glands, which appear like transverse veinlets on the under surface; *leaf-sheaths* striate, keeled, ciliate on the edges, glabrous or appressed, pubescent, ending in a narrow callus, and bearing at the mouth two long falcate auricles fringed with stiff deciduous ciliæ, ·2 to ·4 in. long; *ligule* short, fringed with ciliæ like the auricles. *Inflorescence* a leafy panicle bearing at the verticils short spikes or single spikelets, often long, whip-like, with few spikelets on a filiform rachis; rachis ordinarily smooth, striate, swollen at the joints. *Spikelets* very narrow, linear, 2 to 3 in. long, about ·2 in. broad, often pedicelled, minutely pubescent, with 3 to 5 fertile flowers and usually one or more sterile both above and below; rachilla smooth, jointed below the flowers, swollen at the joints; *empty glumes* 1 or 2, the second then bearing a sterile flower, ·3 to ·4 in. long, narrow, striate, ovate-mucronate; *flowering glume* ·5 in. long, ovate-acute, mucronate, 9—11-nerved, pubescent; *palea* rather longer than flowering glume, 2-keeled, the keels edged half way down with a wavy fringe, ciliate near the tip, 4-nerved on either side, faintly purple-mucronate. *Lodicules* ovate-lanceolate, concave, equal, quite glabrous, 7- to 9-nerved, often thickened at the base which is then darker in colour. *Stamens* exserted, filaments narrow; *anthers* yellow, blunt, or emarginate. *Ovary* stalked, glabrous, ovate, narrowing into a long triquetrous beak forming the *style*, surmounted by 2 to 3 white or purplish *stigmas*. *Caryopsis* obliquely ovoid, glossy, tapering at both ends, ending in a long stiff beak. CEPHALOSTACHYUM GRIFFITHII, *Kurz For. Fl. Burma* ii. 566.

Bhutan (?), Assam, Chittagong and Burma. Collected by Griffith in the forests of Wullaboom in hilly country, also in the Khasia Hills. Found in Assam, in Sibsagar and Dibrugarh, by G. Mann, in 1889 (flowers) and 1890.

The long narrow spikelets in axillary fascicles, spikes or short panicles, are very characteristic. The specimens sent by G. Mann bear the Assamese name of *Behti*, *beti*, and the plants were said to have grown in low damp places in the plains. To this

species I also doubtfully refer the specimens which I collected in 1880 at 4,000 feet in the British Bhutan hills and called *Rivett* by the Lepchas. Mann says that the culms are used for basket work and to make pipes.

PLATE No. 86.—*Teinostachyum Griffithii*, Munro. 1, part of leaf- and flowering-branch; 2, end of flowering shoot; 3, culm-sheath—*of natural size*; 4, leaf-sheath; 5, fertile flower; 6, flowering glume; 7, palea; 8 lodicule; 9 stamens and ovary with lodicules (open); 10, ovary, style and stigmas—*enlarged*. (Nos. 1, 2, 5, 8, 9 from Fitch's drawing in Munro l. c. t. 3; rest from Mann's specimens.)

2. TEINOSTACHYUM WIGHTII, *Beddome Flora Sylv.* ccxxxiii, *Pl.* ccexxiii.

A tall, semi-scandent bamboo. *Culms* at first erect, afterwards supported by the branches of the forest trees under which they grow, and then branches pendulous, 10 to 20 feet long, 1 to 1·5 in. in diameter, bright green; nodes marked by a narrow but conspicuous ring; internodes 14 to 18 in. long, rough above and having a white glaucous band below the node; walls thin, ·05 to ·15 in. *Culm-sheaths* thin, papery, 10 to 12 in. long by 3 to 4 in. broad, the sides parallel below, gradually narrowing above to a truncate top, which is not auricled; 1 to 1·2 in. broad, thickly clothed on the back with brown-black appressed hairs; *imperfect blade* subulate-acuminate, reflexed, slightly decurrent on the sheath, 5 to 7 in. long by ·4 to ·5 in. broad, striate, somewhat hairy; *ligule* ·1 in., entire. *Leaves* oblong-lanceolate, acuminate, 6 to 15 in. long, 1 to 2 in. broad, unequal at the base; rounded or attenuated into a ·3 to ·4 in. long petiole; ending above in a subulate, scabrous twisted point; glabrous above, sparingly hairy and whitish beneath, scabrous on one margin; main vein broad, yellowish, conspicuous, secondary veins 8 to 10 pairs, intermediate 6 to 7, transverse veinlets scanty, not prominent, formed by glands in the leaf; *leaf-sheaths* glabrous, striated, truncate at top; *ligule* narrow, faintly toothed. *Inflorescence* a large terminal drooping panicle of spiciform branchlets, the spikes supported by ovate-acuminate bracts at the joints of the rachis and bearing chiefly fertile spikelets; rachis smooth, slender, thickened above. *Spikelets* ·5 to 1 in. long, bearing 2 to 3 fertile flowers and 1 terminal incomplete flower; rachilla slender, smooth, concavely flattened below, thickened above and slightly ciliate at top; *empty glume* ovate, mucronate, ·2 in. long, faintly hirsute on the back, 5- to 7- nerved; *flowering-glumes* 1 or 2, similar but longer, mucronate and transversely veined; *palea* rather shorter than flowering glumes, 2-keeled, blunt or emarginate, ciliate on the keels, 1-nerved between keels and 2- to 3-nerved at the sides. *Lodicules* small, ·1 in. long, ovate, triangular, ciliate above, concave below, 3- to 5-nerved, persistent. *Stamens* exserted, filaments slender, *anthers* obtuse. *Ovary* depressed-globose, smooth, stipitate, the *style* included in the long beak of the perigynium and ending in 2 short plumose *stigmas*. *Caryopsis* glabrous, ovoid, on a thick stalk and surmounted by a beak.

Slopes of the Western Gháts from N. Kanara down to Cape Comorin, usually at from 3,000 to 5,000 feet, and almost always in the undergrowth of big tree-forest: Anamalai Hills at 4,000 feet.

This pretty bamboo is distinguished easily from the other species by its long, lax, drooping, many-flowered panicle, broad leaves, papery hirsute sheath, and small blunt lodicules. It was gathered in flower by Beddome in the Anamalai Hills (year not recorded); by myself on the Sispara Ghát in 1883 and 1884, and by J. A. Bourdillon

at Peermaad in 1887; and leaf specimens have been collected by W. A. Talbot at the Gairsoppa Falls in N. Kanara, by myself in the Ochterlony Valley and on the Carcoor Ghát, Nilgiris, and by J. A. Bourdillon on the Travancore Hills in 1892. Bourdillon says that in Travancore it flowered in 1887 to 1889 and died off, new young seedlings at once springing up. I cannot agree with Beddome in identifying this species with *Bambusa Wightii*, Munro in Trans. Linn. Soc. xxvi. 111, which is characterized by *very glabrous leaves* and *very long ligules*. Wight's plant is, I believe, an *Ochlandra*, and is herein described as *Ochlandra Brandisii*, n. sp.

PLATE No. 87.—*Teinostachyum Wightii*, Beddome. 1, leaf- and flower-branch; 2, part of flowering panicle—*of natural size*; 3, culm-sheath—*reduced*; 4, bract; 5, spikelet; 6, flowering glume; 7, palea; 8, lodicule; 9, anther; 10, ovary with persistent lodicules, style and stigmas; 11, caryopsis (young)—*enlarged*. (All from my own specimens.)

3. TEINOSTACHYUM ATTENUATUM, *Munro in Trans. Linn. Soc.* xxvi. 143.

A medium-sized, tufted bamboo. *Culms* 12 to 25 ft. long, ·5 to 1 in. in diameter, filiform-wiry at the top; nodes bearing many branches. *Culm-sheaths* pale, appressed hairy. *Leaves* 3 to 6 in. long, ·6 to 1 in. broad, lanceolate acuminate, rounded at the base into a thickened ·1 to ·3 in. long petiole; ending above in a twisted, scabrous, subulate point; slightly rough above, smooth and pale beneath; main vein hardly prominent, secondary veins 3 to 4 pairs, inconspicuous, intermediate 5 to 7, rather thick, with no transverse veinlets but lines of pellucid dots between; *leaf-sheaths* sparingly appressed-pilose, ciliate at the edges, truncate at the mouth and fringed with deciduous ciliæ; *ligule* short, glabrous, entire. *Inflorescence* usually in short, spiciform, leafy panicles clustered at the nodes, the end branches sometimes prolonged with verticillate clusters of spikelets, the clusters subtended by a smooth, mucronate bract and containing several sterile spikelets with a few longer fertile ones, often curved; rachis smooth, swollen above. *Spikelets* glabrous, narrow, 1 in. long, ·2 in. broad, bearing 1 empty glume, then 2 to 3 fertile flowers, then 1 to 2 imperfect flowers; *rachilla* round, smooth, thickened above; *empty glume* ovate-mucronate, ·3 in. long, 7-nerved, ciliate on the edge; *flowering glume* similar but longer and 9- to 11-nerved; *palea* smaller than flowering glume, 2-keeled, minutely ciliate on the keels. *Lodicules* lanceolate, ·15 in. long, 3-nerved, ciliate at the tip. *Stamens* exserted, *filaments* long, twisted, *anther* rather short, bluntly mucronate. *Ovary* ovoid-acuminate, glabrous, produced into a long *style*, divided at about $\frac{2}{3}$ of the way up into 3 long plumose purple *stigmas*. *Caryopsis* attenuate at both ends, glabrous, rostrate. *Beddome Flora Sylv.* ccxxxiv. BAMBUSA ATTENUATA, *Thwaites Enum. Plant. Zeyl.* 375.

Ceylon, in the Central Province at 4,000 to 6,000 feet; collected by Thwaites (No. 3255) in 1864, by T. Thomson, and by H. Trimen in Ohiya Valley, 1890.

This species is distinguished from *T. Griffithii* by the shorter spikelets and ciliate lodicules, from *T. Wightii* by the smaller leaves and quite different inflorescence.

PLATE No. 88.—*Teinostachyum attenuatum*, Munro. 1 & 2, leaf- and flower-branches—*of natural size*; 3, spikelets, one fertile, one sterile; 4, empty glume; 5, flowering glume; 6, palea; 7, lodicule; 8, anther; 9, ovary with style and stigmas—*enlarged*. (All from T. Thomson's or Thwaites's specimens.)

4. TEINOSTACHYUM DULLOOA, *n. sp.* *Gamble.*

A moderate-sized or large tufted bamboo sometimes more or less scandent. *Culms* variable in size, from 20 to 30 ft. long, 1 to 3 in. in diameter, dark green with a few whitish hairs, whitish below the nodes, glossy when dry; nodes little prominent; internodes 16 to 30 in. and even to 40 in. long; walls thin. *Culm-sheaths* variable in size, according to the culms, from 6 in. long and 4 in. broad up to 12 in. long and 10 in. broad, striate, with scattered white appressed hairs prominent above, rounded at top and then somewhat concavely truncate and loosely fringed with stiff bristles; *imperfect blade* narrow, subulate, recurved, very hairy within, the edges convolute, 3 to 6 in. long, ·3 to ·7 in. broad at the rounded base; *ligule* prominent, long-fimbriate. *Leaves* variable, oblong-lanceolate, acuminate; rounded, often unequally, at the base into a rather long ·2 to ·4 in. petiole; subulately acuminate above, the point scabrous, twisted; rough on the upper surface, minutely softly pubescent or nearly glabrous beneath, scabrous on both edges; main vein pale, not very prominent, secondary veins 6 to 10 pairs, intermediate about 7, no transverse veinlets, but a few pellucid dots, which have the appearance of transverse veinlets on the underside; *leaf-sheaths* striate, ciliate on the edges, ending in a ciliate or glabrous callus, and furnished at the mouth with a few long, stiff, very deciduous bristles; *ligule* broad, long-fimbriate. *Inflorescence* a panicle of spiciform branches, bearing verticils of few spikelets, subtended by long truncate bracts. *Spikelets* ·5 to 1 in. long, softly pubescent, those seen only containing imperfect flowers; *glumes* many-nerved, hairy, aristate, convolute; *rachilla* jointed and produced into a long point above the uppermost glume; rest not seen.

Throughout Northern and Eastern Bengal and Burma, from British Bhutan through the Assam and Sylhet valleys and the hills between them to Chittagong and Upper Burma.

Under this species I have brought together a great series of specimens gathered by various collectors in different parts. These specimens fall rather naturally into two divisions: those of large individuals with rather large leaves, and the small ones with small leaves, the latter being chiefly represented by the type, the only specimens which give an idea of the character of the flowers. These flowering specimens are those collected in the garden of the monastery at Hawyaw in the Katha district of Upper Burma, in February 1892, by J. W. Oliver. Oliver says that it is a "small reed-like bamboo" named *Thaikwaba* (Burmese), and that there is a larger variety of the same name. It is much to be regretted that the flowers are imperfect. I have searched and cannot find a single fertile one, but from the spikelets, so far as they go, the genus seems to be this, and the species to come rather near, either to the Ceylon *T. attenuatum*, or to the Burmese *Cephalostachyum virgatum*. Indeed, when we come to know more of the latter or obtain proper flowers of *T. Dullooa*, it is not impossible that the two may prove to be identical. Leaf specimens and culm-sheaths in abundance have been collected; the sheaths are very constant in character, and the leaves do not greatly differ from each other. The specimens here placed, therefore, consist of the following:—From the hills of British Bhutan, from the Róng lake, 2,000 feet, collected in 1880 by E. Fuchs and in 1889 by G. A. Gammie, vern. *Pogslo, paksálu* (Lepcha); *Tokré bans* (Nepalese) and said to be used to make quivers; from the Garo Hills, collected by G. Mann in 1881 and 1889 under the name *Wadroo*, and said to be used for carrying water and for making umbrellas; from the

Jaintea Hills, collected by G. Mann in 1889 under the name *Silloh* at Sotyngia, 3,500 feet, and said to be used for basket-work, and to make small boxes to carry pán; from the Assam Valley, sent by G. Mann from Sibsagar and Kamrúp under the name *Dullooa* (Assamese) and said to be used for buildings, mats and baskets; from Sylhet, collected at Protabgarh by Babu Tara Kisor Gupta, and sent by G. Mann under the names *Dolu* and *Bajail* (Bengali), the former the large, the latter the small variety; from Chittagong, collected by myself at Khagoreea in 1880, under the name *Dolu*, this being the species which Major Lewin in his 'Hill Tracts of Chittagong', Calcutta, 1869, speaks of as a very large kind, "much used for making mats, used in loading vessels 'with cargo", and as having flowered some 15 or 16 years previously; and finally, the Burmese *Thaikwaba* collected in Katha, *Gyawa* collected in Momeik State in 1892-93 and specimens gathered at 6,000 ft. on Taungmè, Ruby Mines District, in 1894, by J. W. Oliver. Besides these, there are specimens in the Kew collection collected by Hooker at Sitakund near Chittagong. It is possible that when good specimens of the flowers are collected, it will be found that there are two species, the smaller *Thaikwaba*, *silloh*, and *bajail;* the larger, *Pogslo, wadroo, dullooa, dolu* and *gyawa;* but in my opinion, and so far as it is possible to judge without the flowers, all the specimens before me belong to one and the same widely distributed species.

PLATE No. 89.—*Teinostachyum Dullooa*, Gamble. 1, leaf-branch; 2, part of inflorescence—*of natural size*; 3, culm-sheaths—*reduced;* 4 & 5, spikelet and bracts—*enlarged* (from Mr. Oliver's *Thaikwaba*).

5. TEINOSTACHYUM HELFERI, *Gamble.*

An evergreen, tufted, bushy or climbing bamboo. *Culms* 20 to 40 ft. high, ·1 to 1·5 in. in diameter, greyish-green when young, sprinkled with appressed whitish bristles, much arched so as to bend completely over and to touch the ground where they take root; nodes somewhat thickened and whitish; internodes 20 to 50 in. long, or more, covered in the upper part with soft, whitish, velvety pubescence when young, when old with a white band; walls thin, scarcely over ·1 in. thick. *Culm-sheaths* 8 to 10 in. long, persistent, thick, brittle, when young bearing few appressed white bristles which leave a scar when they fall, rough towards the base, truncate at top; *imperfect blade* nearly as long as the sheath, recurved, lanceolate, acuminate, glabrous or shortly hispid, rounded at the base and decurrent as a very narrow long-fringed band on the top of the sheath; *ligule* narrow, conspicuously fringed with white stiff hairs, ·2 to ·3 in. long. *Leaves* very variable in size, usually large, oblong-lanceolate, 6 to 18 in. long, 1 to 3 in. broad, unequal at the base, and then contracted into a ·3 to ·4 in. long, broad petiole; cuspidate-acuminate above in a long scabrous twisted point; scabrous on marginal veins, otherwise smooth; glaucescent and glabrous beneath, except for a few hairs near the base; scabrous on the edges; main veins thick, prominent, secondary veins 7 to 15 pairs, rather indistinct, intermediate 5 to 7, pellucid glands showing on dry specimens as transverse veinlets; *leaf-sheaths* glabrous, smooth, striate, ending in a smooth callus and a short, very deciduous, long-fringed auricle; *ligule* narrow, fringed, the hairs very easily broken. *Inflorescence* in long terminal whip-like spikes, bearing distant heads of few spikelets; rachis very slender, densely hairy, thickened and bent s-fashion,

where it meets the flower heads, joints long. *Spikelets* (only sterile once seen) containing 2 to 3 empty glumes which are striate, hairy, mucronate. Rest unknown. BAMBUSA HELFERI *Munro in Trans. Linn. Soc.* xxvi. 114. PSEUDOSTACHYUM HELFERI, *Kurz For. Fl. Burma* ii. 568.

Garo and Khasia and Jaintia Hills in Assam, and in hill forests down to the Pegu Yoma and Martaban, up to 3,500 feet elevation and always in moist valleys forming dense, almost impenetrable jungle.

The characters of the few sterile spikelets on the specimen sent by G. Mann in 1889 from the Garo Hills, have decided me to place this species in *Teinostachyum* rather than in *Pseudostachyum*. It was first collected by Helfer in 1839 (No. 411); afterwards by Brandis, *Wathabwot* (Burmese); and Kurz *Wanwae, wathabwot* (Burmese). It has also been sent from Burma by P. J. Carter and others. The Garo Hill specimens bear the name *Wali*, and those from the Khasia Hills *Tumoh*. It appears to be hardly used except for basket-work. The large unequal leaves, the long culm-internodes, (a specimen in the Dehra Dún Forest School Museum has two joints, one 48, the other 52 in. long), the brittle thick culm-sheath with long-fringed ligule, and the hairy rachis to the spikes seem the best characteristics. This species comes evidently very near to *T. Griffithii*. It flowered in the Jaintia Hills in Assam in 1888, and then died off. It is also said to have flowered in Burma about 1888.

PLATE No. 90.—*Teinostachyum Helferi*, Gamble. 1, leaf-branch; 2, part of flower-panicle—*of natural size*; 3, culm-sheath—*somewhat reduced*. (No. 2 from G. Mann's Garo Hills specimen, the rest from Kurz' Burma specimens.)

11. Cephalostachyum, *Munro*.

Shrubby or arborescent bamboos. *Culms* rather thin, usually smooth, straight. *Culm-sheaths* usually thin, sometimes thick, more or less auricled. *Leaves* various in size, like those of *Bambusa*, more usually ovate, long-acuminate. *Inflorescence* a terminal globose head or a panicle of heads with spreading branchlets, heads bracteate, the fertile flowers usually mixed with many imperfect ones or with empty glumes. *Spikelets* one-flowered, elongate, the rachilla produced beyond the flower. *Empty glumes* 2 to 3, broad, chaffy, many-nerved, usually long-awned. *Flowering glume* similar, but more membranaceous and with shorter awns, convolute. *Palea* thin, many-nerved and usually transversely nerved, 2-keeled, keels close together, often 2-mucronate. *Lodicules* 3, conspicuous, persistent, 3—5-nerved, often papillose. *Stamens* 6, *anthers* long, filaments distinct. *Ovary* ovoid, stalked, produced into a long thickened *style*, and divided at the top into 2 to 3 short plumose *stigmas*. *Caryopsis* oblong, glabrous, beaked; pericarp thickened, separable.

DISTRIB.—Seven species, all from the North-East Himalaya, Assam and Burma, one only (*C. pergracile*) crossing the Bay of Bengal and re-appearing in Chota Nagpur.

Analysis of the species.

Spikelets in single terminal globose heads—SECTION I.

Heads not more than 1·5 in. in diameter; leaves rather small.

Leaves moderately large, palea entire at the apex, anthers blunt . . 1. *C. capitatum.*

Leaves small, palea bifid, anthers apiculate . . . . 2. *C. pallidum.*

Heads more than 1·5 in. in diameter; leaves large.
Culm- and leaf-sheaths not fringed, palea undivided . . . . . . 3. *C. latifolium.*
Culm- and leaf-sheaths fringed; palea bifid . . . . 4. *C. Fuchsianum.*

Spikelets in heads in interrupted paniculate spikes—Section II.
Heads softly hairy, many-flowered.
Leaves rather large, culm-sheath auricles rounded, rachis very slender 5. *C. pergracile.*
Leaves small, culm-sheath auricles pointed, rachis moderately thick . 6. *C. flavescens.*
Heads nearly glabrous, flowers few . . . . 7. *C. virgatum.*

SECTION I.

1. Cephalostachyum capitatum, *Munro in Trans. Linn. Soc.* xxvi. 139.

A shrubby or sub-arborescent, semi-scandent bamboo. *Culms* 12 to 30 ft. long, thin-walled, yellow, strong below, loose above and so scandent on the branches of trees; nodes not very prominent; internodes long, often 3 ft. or more, 1 to $1\frac{1}{2}$ in. in diameter, walls ·2 to ·3 in. thick. *Culm-sheaths* rather thin, papery on the upper part of the young culm, thicker on the lower joints, 6 to 12 in. long, 2 to 3 in. broad, covered on the back with pale-brown appressed pubescence, mouth triangular, truncate on the longer upper sheaths, on the shorter lower ones rounded with concave sinus; *imperfect blade* long, erect or recurved, hairy within, rounded at the base and decurrent on the sheath into rounded, sometimes fringed auricles; *ligule* narrow, serrate. *Leaves* pale green, whitish beneath, ovate-lanceolate, rounded at the base, unequally, into a short, ·2 to ·3 in., petiole; ending above in a long, scabrous, twisted, setaceous, acuminate point; 4 to 8 in. long, 1 to 2 in. broad, glabrous on both sides, rough on the edges; main vein prominent, pale, secondary veins 4 to 10 pairs, inconspicuous, intermediate 6 to 7, no regular transverse veinlets, but distant pellucid dots which have the appearance of oblique transverse veinlets below; *leaf-sheaths* smooth, glabrous, shining, ending in a short auricle with a few, long-curved deciduous ciliæ. *Inflorescence* a dense, globular, terminal or axillary brownish head, 1 to 1·5 in. in diameter supported by broad, long-aristate, glabrous bracts, and consisting of many, long-aristate, keeled empty glumes or sterile spikelets and with a few shorter fertile spikelets. *Spikelets* ·5 to ·7 in. long, at the ends of short spikes, bearing 1 to 3 sterile flowers below; *empty glumes* 2, ovate, concave below and ending in a long scabrous awn, glabrous above, softly hairy below, many-nerved and with transverse veinlets, ·4 to ·5 in. long by about ·2 in. broad; *flowering glume* similar but narrower and with a shorter awn; *palea* as long as the flowering glume, convolute, thinner in texture, conspicuously nerved both longitudinally and transversely, 2-keeled, the keels close together and hairy between, shortly hairy and bluntly mucronate at tip; *rachilla* produced, short. *Lodicules* ·2 in. long, ovate-lanceolate, rounded and shortly ciliate above, 3—5-nerved, minutely papillose-hairy. *Stamens* exserted, filaments long; *anthers* long, narrow, bluntly emarginate at the apex. *Ovary* ovoid, stalked, produced into a long, thickened, often twisted *style* which is cleft at apex into 2 short bifid hairy *stigmas*. *Caryopsis* chestnut-brown, smooth, shining, ovate, depressed, ending in a short conical beak formed by the persistent base of the style, and supported by the persistent glumes and lodicules; pericarp thick, crustaceous. Bambusa capitata, *Wall. and Griff. in Wall, Cat.* 8913.

North-East Himalaya and Khasia, Jaintea and Naga Hills; occurring in Sikkim snd Bhutan at between 2,000 feet and 8,000 feet altitude, and at elevations the aame or rather lower in the Khasia Hills. In Sikkim it has been collected by Hooker and Thomson, T. Anderson, G. King and others; in the Khasia Hills by Wallich, Griffith, Hooker and Thomson, C. B. Clarke, &c., and in the Naga Hills by F. C. Colomb in 1886.

This very pretty, graceful, small bamboo often forms dense thickets on the hill-sides, and appears to flower at very frequent intervals, as has been recorded by collections in Sikkim in 1848? (Hooker and Thomson); 1866 (T. Anderson); 1869 (C. B. Clarke); 1874 (Gamble); 1878 (G. King); 1892 (G. A. Gammie), and in the Khasia Hills in 1830 and 1835 (Griffith); 1850 (Hooker and Thomson); 1871-72 (C. B. Clarke). Perhaps the real reason is that, like *Dendrocalamus strictus*, it flowers sporadically and then, now and again, has years of wholesale seeding, as happened in my own observation in 1874, when large tracts in the Chel and Neora valleys in British Bhutan covered with this species died off and became the scene of a great conflagration in the following year. It is known in Sikkim as *Gobia*, *gope* (Nepalese) and *Payong* (Lepcha); in the Khasia Hills as *Sillea* and *Sullea.* I also refer, although doubtfully, to this species, the *Serrah* and *Ternap* collected in leaf only by G. Mann in 1889-90 in the Jaintia Hills, though the culm-sheaths are longer and have longer imperfect blades, and in some respects more resemble *Teinostachyum Dulloa.* The wood is used by the Lepchas, in preference to that of other kinds, for making bows and arrows, and it is good for basket-work. The leaves are used for fodder. It is occasionally difficult to distinguish this, both from *C. pallidum* and from *C. latifolium;* but the blunt anthers and uncleft mucronate palea are characteristic.

VAR. β *decomposita;* spikelets arranged in spicate almost paniculate clusters with many fertile spikelets. Collected by T. Anderson and Kurz in Sikkim.

TAB. 91.—*Cephalostachyum capitatum*, Munro. 1 & 2, leaf-branches with flower-heads—*of natural size*; 3 & 4, culm-sheaths—No. 3 from the upper part of the young culm, (Gamble), 4 from the lower (G. A. Gammie)—*reduced*; 5, spikelet with sterile flowers and bracts below; 6, empty glume; 7, flowering glume; 8, palea; 9, lodicule; 10, stamens (young) and ovary with style; 11, caryopsis—*enlarged* (chiefly from my own specimens).

2. CEPHALOSTACHYUM PALLIDUM, *Munro in Trans. Linn. Soc.* xxvi. 139.

A shrubby or small arboreous bamboo, with branches verticillate at the nodes, often most numerous. *Culms* and *culm-sheaths* not known. *Leaves* pale green, ovate-lanceolate, unequally rounded at the base into a rather long ·2 in. petiole which is often wrinkled; rather suddenly narrowed above into a scabrous subulate point ending in a long hair-like tip; 1 to 5 in. long and ·5 to 1 in. broad; glabrous on both sides or minutely pubescent below, rough on the edges which are somewhat cartilaginous; main vein pale, secondary veins 4 to 6 pairs, intermediate 7, no transverse veinlets; *leaf-sheaths* striate, ciliate on the edges, ending in a short, rounded auricle furnished with a few very early deciduous ciliæ; *ligule* long, sometimes ciliate. *Inflorescence* a

pale terminal head about 1 in. in diameter, supported by a leaf and broad, rounded, glabrous, sheath-like bracts, and consisting of many long aristate empty glumes or sterile spikelets, with few exserted fertile spikelets. *Spikelets* ·7 to ·8 in. long; *empty glumes* sessile, or with few empty bractlets at the base, ·5 to ·6 in. long, ovate, concave and ending in a long, usually ·2 in., scabrous awn, many-nerved, sometimes pubescent on the back below the awn; *flowering glume* similar but with a shorter awn; *palea* as long as the flowering glume, thinner in texture, many-nerved, with both longitudinal and transverse veins, 2-keeled, the keels close together, bifid-mucronate at apex, hairy below the keels and at the tip, rachilla produced, short. *Lodicules* about ·15 long, lanceolate or spathulate-lanceolate, 3—5-nerved, minutely papillose, pubescent, ciliate at the tip. *Stamens* exserted, filaments long; *anthers* long-apiculate. *Ovary* ovoid-lanceolate, extended into a long conical *style* with 2 hairy short *stigmas*. *Caryopsis* chestnut brown, glabrous, ovoid-globose, conical above and wrinkled, ending in a beak formed by the persistent base of the style and supported by the persistent glumes and lodicules. *Kurz For. Fl. Burma* ii. 563.

Khasia Hills, Mishmi Hills, Patkaye Range and Manipur, ascending to 5,000 ft. Collected by Griffith (Nos. 6733, 6718), C. B. Clarke and G. Mann.

This graceful species is distinguished with some difficulty from *C. capitatum;* but it has much smaller leaves, longer ligules, a bifid palea and apiculate anthers. The culms and culm-sheaths have unfortunately not been described. It was gathered in flower by Griffith in 1835, by C. B. Clarke in 1872 and 1885-86, and by G. Mann in 1878. Munro says that this is called *Betee bans;* but the bamboo more commonly known as *Betee* or *Behti* is *Teinostachyum Griffithii*, Munro. Griffith's specimens were found on the summit of the Patkaye Range, and on its southern side, on his journey from Naga to Hookoom (Griff. Journ. 64).

PLATE No. 92.—*Cephalostachyum pallidum*, Munro. 1 & 2, leaf- and flower-branches—*of natural size*; 3, spikelet; 4, empty glume; 5, flowering glume; 6, palea with stamens and style; 7, lodicule; 8, anther; 9, ovary with style and stigmas; 10, caryopsis—*enlarged* (from C. B. Clarke's specimens).

3. CEPHALOSTACHYUM LATIFOLIUM, *Munro in Trans. Linn. Soc.* xxvi. 140.

A shrubby, semi-scandent bamboo. *Culms* thin, dark green, rough, whitish below the nodes, which are marked by a conspicuous ring. *Culm-sheaths* thin, papery, straw-coloured, 6 to 9 in. long, 2 to 3 in. broad, sides parallel, top rounded and ending in a concave sinus ·7 in. in diameter, with rather sharp, triangular, glabrous auricles; *imperfect blade* 4 to 5 in. long, ·3 to ·5 in. broad, subulate, acuminate; *ligule* broad. *Leaves* very large, ovate or ovate-lanceolate, unequal at the base; wedge-shaped or rounded into a thick ·3 to ·4 in. wrinkled petiole; ending above in a scabrous, setaceous tip; 10 to 16 in. long, 1 to 4 in. broad; main, vein prominent, pale, secondary veins 8 to 18 pairs, conspicuous, intermediate 7 to 10, no regular transverse veinlets, but distant pellucid dots which give sometimes the appearance of transverse veinlets on the underside; *leaf-sheaths* striate, ciliate on the edges, ending in a broad, thick, emarginate callus, and produced beyond it to meet the broad *ligule*, which is again long produced and often up to ·2 in. or more. *Inflorescence* a thick, terminal globular head, often 2 in. in diameter, composed of clusters of spikelets, some

fertile, some sterile, supported by broad, striate, keeled, aristate bracteoles. *Spikelets* 1-flowered, acuminate, long-aristate, ·6 to ·9 in. long; *empty glumes* ·6 in. long, ovate-lanceolate, long awned, glabrous except the scabrous awn, striate, somewhat keeled; *flowering glume* similar but lanceolate-acuminate, and with a shorter awn and transverse veinlets; *palea* membranous, both longitudinally and transversely veined, ending in a blunt hairy point, convolute; *rachilla* produced, short. *Lodicules* ovate-lanceolate or spathulate, ciliate, 3-nerved, ·2 in. long, minutely papillose-pubescent. *Stamens* exserted, filaments long, *anthers* bluntly mucronate. *Ovary* ovoid, surmounted by a long *style* which is flattened above and finally divided into two short plumose *stigmas*. *Caryopsis* chestnut brown, shining, broadly ovoid, stalked, ·3 in. long, ·15 in. broad, curved above, ending in a beak formed by the persistent base of the style, and supported by the persistent glumes and lodicules; pericarp crustaceous.

North-East Himalaya in British Bhutan, up to 5,000 feet; also in Manipur at 7,000 feet. Collected by Griffith (1835); by myself (1879) at Dumsong in British Bhutan; and by G. Watt in Manipur in 1882.

This species is at once distinguished from *C. capitatum* by the large broad leaves and long ligules; and from *C. Fuchsianum* by the absence of ciliated fringes to the leaf-sheaths and by the undivided *paleæ*. The specimens of leaves and culm-sheaths sent from Upper Burma by J. W. Oliver under the name of *Gyawa* (Burmese), *Laka* (Kachin), resemble this, but the ligules are much smaller and the culm-sheaths are ciliate at the top.

PLATE No. 93.—*Cephalostachyum latifolium*, Munro. 1, leaf- and flower-branch—*of natural size*; 2, culm-sheath—*reduced*; 3, cluster of spikelets, mostly sterile; 4, empty glume; 5, flowering glume; 6, palea; 7, lodicule; 8, anther; 9, ovary with style and stigmas; 10, same when older supported by persistent lodicules; 11, caryopsis—*enlarged* (No. 2 from my own, rest from Griffith's specimens.)

4. CEPHALOSTACHYUM FUCHSIANUM, *n. sp. Gamble.*

A medium-sized, arborescent, semi-scandent bamboo. *Culms* small, soft, thin-walled, pale, verticillately branched from the nodes. *Culm-sheaths* thin, striate and reticulately veined at the edges, sides nearly parallel, rounded at the top on each side into a deep (often 1 in. deep and ·5 in. broad at bottom) concave long bristly-fringed sinus, 12 in. long by 4 in. broad, clothed on the back with appressed light brown pubescence; *imperfect blade* inserted at the base of the sinus, reflexed, subulate, 6 to 8 in. long, ·7 to ·8 in. broad, closely pubescent below; *ligule* small; younger sheaths cylindrical, the mouth furnished with rows of long, white, stiff, bent bristles. *Leaves* large, ovate-lanceolate, angled or rounded at the base rather abruptly into a ·5 to ·6 in. long, thick petiole; cuspidately acuminate with a scabrous, twisted point; glabrous on both sides, scabrous on the edges; 8 to 14 in. long, 2 to 4 in. broad; main vein prominent, shining, secondary veins 7 to 10 pairs, intermediate 8 to 10, pellucid glands giving the appearance of transverse veinlets when dry; *leaf-sheath* soft, dark green, striate, thickly long-ciliate on the edges, ending in a rounded callus and produced at the top into an elongated auricle thickly clothed with thick, white, stiff bristles which are often ·6 to ·7 in. long; *ligule* moderately long, ciliate. *Inflorescence* a dense, globular, terminal head, 2·5 in. in diameter, or else an elongated, densely packed, terminal, congested spike of superposed heads,

consisting of many fertile spikelets among empty aristate bracts or sterile smaller spikelets. *Spikelets* elongate, ·8 to 1 in. long, glabrous; *empty glumes* ·6 to ·7 in., ovate at base, long-scabrous-aristate above, glabrous, striate, with 17 to 19 nerves; *flowering glume* similar but more elongate and more shortly aristate, 21- to 23-nerved, and transversely veined; *palea* rather longer than flowering glume, thin, ovate-lanceolate, bifid at apex, the tips mucronate, pubescent, 2-keeled, the keels close together, 5-6-nerved and transversely nerved on either side; *rachilla* produced, short. *Lodicules* linear-lanceolate or spathulate, blunt, 3- to 5-nerved, minutely ciliate above and papilose on the sides. *Stamens* long exserted, drooping; anthers sharply apiculate or forked at the tip. *Ovary* narrowly ellipsoid, produced into a thick *style*, divided above into 2 short *stigmas*. *Caryopsis* chestnut brown, similar to that of *C. latifolium*, but more rounded at top ; pericarp crustaceous.

Eastern Himalaya, in the hills of British Bhutan about Dumsong, Laba and Songchonglu, 6,000 to 8,000 ft., also in the Daphla Hills at Shamgarh, 6,800 ft.; collected in flower by G. A. Gammie in 1889 and 1892, in leaf only; in 1880 by myself, by E. Fuchs in 1877 (?), and by Lister in the Daphla Hills in 1875.

I first met with this beautiful species when it was sent to me by the late Mr. E. Fuchs, Assistant Conservator of the Tista Forests, who had taken some considerable trouble to collect bamboos there; and thinking it to be a *Cephalostachyum*, not traceable in Munro's Monograph, I gave it later on the Herbarium name of *C. Fuchsianum*, to which I now adhere. I afterwards found it myself in 1880. It is apparently quite a local species, but it is now in cultivation, owing to the distribution of the seed collected by Mr. Gammie. It will probably be found to succeed in Europe, perhaps even in the open air. The Lepchas know it by the name of *Palóm*. It is easily recognized by the long fringes to the leaf sheaths, the deeply indented top of the culm-sheath, and the bifid palea.

Plate No. 94.—*Cephalostachyum Fuchsianum*, Gamble. 1, leaf- and flower-branch; 2, part of the spicate form of inflorescence; 3, leaf-sheath—*of natural size*; 4, old culm-sheath; 5, culm-sheath of young shoot—*reduced*; 6, spikelet; 7, empty glume; 8, flowering glume; 9, palea; 10, lodicule; 11, anther; 12, ovary and style; 13, caryopsis—*enlarged* (all from G. A. Gammie's specimens).

SECTION II.

5. Cephalostachyum pergracile, *Munro in Trans. Linn. Soc.* xxvi. 141.

A deciduous, arboreous, tufted bamboo. *Culms* erect, glaucous-green, somewhat whitish-puberulous below the nodes, 30 to 40 ft. high, 2 to 3 in. in diameter; nodes scarcely thickened; internodes 12 to 18 in. long, walls very thin. *Culm-sheaths* much shorter than internodes, 4 to 6 in. long, 6 to 8 in. broad, densely covered with black, stiff, deciduous hairs, afterwards polished chestnut brown; *imperfect blade* 2 in. long, ovate, cordate, cuspidate, densely hairy within, decurrent into a wavy fringe bordering the top of the sheath and ending on either side in a rounded auricle; both fringe and auricle edged with long, stiff, curved, white bristles, which are often ·5 in. long; *ligule* very narrow, entire. *Leaves* variable, linear-lanceolate, 6 to 14 in. long by 1 to 1·5 and even 2·5 in. broad, thin; rounded or cuneate at the base into a short ·2 in. petiole; above subulate, acuminate, with a scabrous point; scabrous on the edges and rough on both sides,

glaucescent beneath; main vein conspicuous, secondary veins 7 to 13 pairs, intermediate usually 5, transverse veinlets few, oblique; *leaf-sheaths* glabrous, faintly striate, ending in a small ciliate callus and auricled at the mouth with a few long white ciliæ which are early caducous; *ligule* very narrow, entire. *Inflorescence* a large panicle with verticels of long, drooping, filiform spikes, bearing distant broad heads of spikelets supported by small chaffy sheathy bracts; the rachis very slender, wiry, thickened above, and 1·5 to 2 in. between the clusters. *Spikelets* in bracteate clusters, ·5 to ·7 in. long, no regular *empty glumes*, but 1 to 2 sterile flowers, then a fertile flower, then a terminal sterile flower or filiform produced rachilla; *flowering glume* ·5 to ·7 in. long, ovate-lanceolate, many-nerved, densely pale-hairy, long-mucronate; *palea* as long as flowering glume, 2-keeled, the keels close together, ciliate, apex deeply bifidly mucronate. *Lodicules* narrow, about ·2 in. long, lanceolate, somewhat obtuse and ciliate at tip, 3- to 5-nerved, concave at the base and persistent. *Stamens* with narrow filaments; *anthers* purple, obtuse. *Ovary* smooth, sub-globular at the base and prolonged above into a 3-cornered *style* ending in 2 to 3 stout recurved *stigmas*. *Caryopsis* obovate-oblong, shining, ·5 in. long, ending in a straight beak also about ·5 in. long and somewhat compressed, grooved on one side. *Kurz For. Fl. Burma* ii. 564.

Throughout Burma, where it is common in upper mixed forests and often gregariously forming forests by itself. Collected in flower by Brandis in 1862 and 1880. To this species I refer the bamboo collected by myself in 1881 at Luia in the Kolhan forests, Singhbhúm district, Chota Nagpur; also the *Latang* (Naga) bamboo collected by G. Mann in the Sibsagar district of Assam, but from *planted* specimens; and the *Madang* (Singpho) collected in 1890 by Kripa Nath Dé in Lakhimpur, Assam. Mann says, however, that it is wild, growing in clumps on the lower Naga Hills, and that it is used by the Nagas for basket-work. The Burmese name is *Tinwa*.

This beautiful species is probably the most common of all Burmese bamboos except *Dendrocalamus strictus;* and, as I am informed by J. W. Oliver, it may be found almost any year flowering sporadically like *Dendrocalamus strictus* and *Hamiltonii*, but not generally producing good seed on such occasions. The Kolhan and Assam localities would point to its having a wider range than is generally supposed. The culms are largely used for building and mat-making and other purposes, and in Burma the joints are used for boiling *kauknyin* or glutinous rice, the effect being to make a long mould of boiled rice which can be carried about to be eaten on journeys. It is at once recognized by the characteristic inflorescence, the short sheaths with rounded, long-fringed auricles, and long bifidly-mucronate palea.

PLATE No. 95.—*Cephalostachyum pergracile*, Munro. 1, leaf-branch; 2, part of flower-panicle—*of natural size*; 3, culm-sheath—*slightly reduced*; 4, cluster of spikelets; 5, smaller cluster; 6, spikelet open, showing sterile flower, flowering glume, palea and produced rachilla with rudimentary flower; 7, palea; 8, stamens and lodicules; 9, lodicule; 10, anther; 11, ovary and persistent lodicules; 12, caryopsis (young ?)—*enlarged* (all from Brandis's Burma specimens)

6. CEPHALOSTACHYUM FLAVESCENS, *Kurz For. Fl. Burma* ii. 564.

An evergreen, tufted, semi-arborescent bamboo. *Culms* dull green, turning yellow, 10 to 20 ft. high, smooth; nodes not prominent; internodes rather long, 1 to 1·5 in.

in diameter. *Culm-sheaths* rather short, 4 to 5 in. long by about 5 in. broad at base, smooth or covered with appressed white or pale brown bristly hairs, ending in a triangular truncate top; *imperfect blade* long-ciliate on the margins, the edges convolute, 1 to 1·5 in., erect, ovate, cordate, cuspidate, decurrent into a wavy fringe bordering the top of the sheath and ending on either side in a long pointed auricle, that on one side being bent downwards, that on the other upwards, both fringe and auricle edged with stiff curved bristles ·1 to ·2 in. long; *ligule* narrow, entire or slightly toothed. *Leaves* small, linear, 3 to 6 in. long by ·4 to ·7 in. broad, contracted at the base into a very short petiole; acuminate above in a long slightly scabrous point; glabrous, except for a few long hairs beneath, scabrous on both edges; main vein narrow, secondary veins 4 to 6 pairs; intermediate 5 to 7, faint; *leaf-sheaths* smooth, glabrous, ending in a very narrow callus and produced at the sides into long, narrow, glabrous auricles which are furnished with a few short deciduous ciliæ; *ligule* narrow, inconspicuous. *Inflorescence* a leafy branching panicle of few verticillate branchlets, bearing heads of spikelets supported by a glabrous bract; *rachis* slender, glabrous, distance between spikelet clusters usually 2 to 2·5 in. *Spikelets* mostly fertile, linear, acuminate, hairy, ·5 in. long with a few empty bract-like glumes or sterile spikelets between; *empty glumes* 1-2, ovate-lanceolate, mucronate, white-hairy, about 7- to 9-nerved; *flowering glume* similar; *palea* as long as flowering glume, 2-keeled, the keels close together, white-pilose on the edges, the tip deeply bifidly mucronate. *Lodicules* oblong, about ·2 in. long, obtuse, ciliate at the tip, 3- to 5-nerved, concave at the base. *Stamens* at first greenish, then turning yellow; *anthers* obtuse or acute. Ovary ovoid-acuminate, rounded, stipitate, smooth, ending in a long three-cornered *style* divided above into slightly white hairy *stigmas*. *Caryopsis* not known. MELOCANNA LUTESCENS, *Kurz in Journ As. Soc. Beng.* xlii. 300.

Burma ?: exact country not known, but said by Kurz to have been introduced from Pegu into the Royal Botanic Gardens, Calcutta. Cultivated also in the Agri-Horticultural Society's Garden in Madras, and perhaps elsewhere. Specimens of a bamboo planted near the Kaulagarh Canal, Dehra Dún, resemble this; but the leaves and leaf sheaths are more hairy and the culm-sheaths have more rounded auricles.

This species is distinguished from *C. pergracile* by the pointed culm-sheath auricles which are directed one upwards, the other down, by the smaller leaves and by the inflorescence having smaller heads, thicker rachis, and bearing leaves. The spikelets do not differ much.

PLATE No. 96.—*Cephalostachyum flavescens*, Kurz. 1, leaf-branch; 2 & 3, flowering branches; 4, young shoot; 5, culm-sheath—*about natural size;* 6, spikelet; 7, empty glume; 8, palea; 9, lodicule; 10, anther; 11, ovary with style and stigmas—*enlarged.* (All from Kurz' specimens.)

7. CEPHALOSTACHYUM VIRGATUM, *Kurz For. Fl. Burma* ii. 565.

A sub-arboreous bamboo; *culm*, *culm-sheaths* and *leaves* unknown. *Inflorescence* a large, leafless, drooping panicle, bearing on fasciculate branchlets distant lax heads, consisting of rather few, nearly glabrous, spikelets, supported by a narrow chaffy bract, the fertile spikelets mixed with sterile ones or empty glumes; *rachis* smooth, flattened on one side, the distance between the heads gradually decreasing. *Spikelets* narrow, acute, ·5

to ·6 in. long, with 1 to 2 small sterile flowers at the base; *empty glume* ovate mucronate, short; *flowering glume* ·4 in. long, glabrous except a few white hairs, convolute, coriaceous, shortly mucronate; *palea* rather longer than the flowering glume, nearly glabrous, 2-keeled, keels rather faint and close together, shortly bi-mucronate. *Lodicules* lanceolate-acuminate, shortly ciliate, faintly 3-nerved. *Stamens* with narrow filaments; *anthers* narrow, obtuse. *Ovary* stalked, ovate, glabrous, surmounted by a thickened *style* bearing 2—3 plumose purple *stigmas*. *Caryopsis* not known. MELOCANNA VIRGATA, *Munro in Trans. Linn. Soc.* xxvi. 133.

Upper Burma at Keouksik (*Kyauksit*) on the Mogaung river, collected only by Griffith (see Journal, page 89), No. 6732 of list.

This species, clearly a *Cephalostachyum*, is distinguished from the two preceding by the heads bearing fewer flowers and being nearly glabrous, and by the much thicker rachis. It may be hoped that, as Upper Burma is gradually explored, better specimens may become available.

PLATE No. 97.—*Cephalostachyum virgatum*, Kurz. 1 & 2, flowering branches—*of natural size;* 3, cluster of spikelets; 4, spikelet; 5, empty glume; 6, flowering glume; 7, palea; 8, anthers, style and lodicules; 9, lodicules; 10, anther—*enlarged*. (All from Griffith's No. 6732.)

Sub-tribe 4.—MELOCANNEÆ.

Stamens 6 only.
- Lodicules none; spikelets very small . . . . 12. *Dinochloa.*
- Lodicules 2 or more.
  - Caryopsis small, with hard or crustaceous pericarp . . . . . 13. *Schizostachyum.*
  - Caryopsis very large, with thick and fleshy pericarp . . . . 14. *Melocanna.*

Stamens 6 or more, lodicules irregular in number, caryopsis large, with thick fleshy pericarp . . . . 15. *Ochlandra.*

12. Dinochloa, *Büse.*

Lofty climbing bamboos, with zigzag culms. *Culms* moderately thick, zigzag, climbing, usually covered by the persistent sheaths. *Culm-sheaths* thick, loosely-clasping, wrinkled at the base, where a broad leathery ring remains after the sheath falls; *imperfect blade* long. *Leaves* large, rather soft in texture, with transverse veinlets. *Inflorescence* a large compound panicle of thin spicate clusters of spikelets. *Spikelets* very minute, very numerous, in sub-globose sessile heads or short branchlets, 1-flowered; rachilla short, not articulate, not produced. *Empty glumes* 1 to 4, broad, very obtuse, muticous, gradually larger upwards. *Flowering glume* similar. *Palea* convolute, equal to, or larger than, the flowering glume, not keeled. *Lodicules* none. *Stamens* 6, free, short. *Ovary* ovate, glabrous; *style* short. *Caryopsis* ovoid, acuminate.

DISTRIB.—Two species; both Indo-Malayan.

Analysis of the species.

Culm-sheaths attenuate at the apex, leaves moderate-sized . . 1. *D. Tjankorreh.*
Culm-sheaths truncate at the apex, leaves large . . . . . 2. *D. M'Clellandi.*

1. DINOCHLOA TJANKORREH, *Büse in Miq. Pl. Jnngh.* 388.

An evergreen, lofty, scandent bamboo. *Culms* up to 100 ft. long, 1 in. or more in diameter, zigzag-geniculate, green, glossy; nodes swollen, marked by the coriaceous, persistent bases of the fallen sheaths, those of branches often thorny; internodes 9 to 18 in. long, hairy in the upper part, walls thin; *culm-sheaths* loose, cylindrical, gradually attenuate towards the mouth which is not auricled, sprinkled with minute white fugacious bristles, base leathery and persistent, upper margins somewhat waved; *imperfect blade* ovate-lanceolate, acuminate, spreading or erect, minutely hispid above; *ligule* rather broad, entire or slightly toothed. *Leaves* moderately large, 6 to 10 in. long, 1 to 1·5 in. broad, rather soft, lanceolate, acuminate, attenuate at the base into a very short hairy petiole; point setaceous, slightly rough; smooth on both surfaces, slightly scabrous on the edges; main vein conspicuous, secondary veins 7 to 9 pairs, transverse veinlets conspicuous owing to pellucid glands; *leaf-sheaths* glabrous when old, appressed-hairy when young, striate, ending in a callus and a rounded mouth with long white stiff ciliæ; *ligule* rather broad, truncate, long-ciliate. *Inflorescence* a large compound panicle of spicate, thin, wiry branches; the rachis curved, smooth, striate, flattened on one side, marked at the nodes by a ring formed by the bases of fallen bracts; clusters very small, with few fertile spikelets and many empty glumes. *Spikelets* very small, at most ·1 in. long, ovate, glossy, brown, glabrous, one-flowered; *empty glumes* 1 with 1 or 2 smaller at the base below the articulation, broad, obtuse, convolute, muticous, 5- to 7-nerved; *flowering glume* similar to empty glume; *palea* rounded, much convolute. *Stamens* included, filaments short, *anthers* with an acute tip. *Ovary* ovate, ending in a thick *style*, and bifid non-plumose *stigma*. *Caryopsis* ovoid, shortly beaked, ·1 to ·2 in. long, fleshy. *Miq. Fl. Ind. Bat.* iii. 415; *Munro in Trans. Linn. Soc.* xxvi. 153, Pl. V; *Kurz in Ind. Forester* i. 352. BAMBUSA SCANDENS, *Blume, ex Nees in Flora* vii. (1824) 291. NASTUS TJANGKORREH, *Schultes Syst. Veg.* vii. 1358; *Kunth Enum.* i. 430; *Steudel Syn.* 333. CHUSQUEA AMPLOPANICULATA, *Steud. Syn.* 337; *Miq. Fl. Ind. Bat.* iii. 415.

Malay Peninsula: collected at Larut in Perak by H. W. Ridley in 1892 (No. 3112). Extending to Java, Borneo and throughout the Moluccas.

VAR. *andamanica*.—Spikelets straw-coloured; leaves rather larger, up to 12 in. long and 2 in. broad, softer, ovate-lanceolate, their sheaths more ciliate at the mouth and with a more fimbriate ligule. DINOCHLOA ANDAMANICA, *Kurz in Journ. As. Soc. Beng.* xlii. (1873), ii. 253; *Kurz For. Fl. Burma* ii. 570.

Andaman and Nicobar Islands: collected in the Mount Harriet tropical forests, S. Andaman, by Kurz, 1875; by Sieber in 1858; by A. L. Home in 1874; in the Nicobar Islands by Kurz in 1875; and by Jelinek (Austrian 'Novara' Expedition), (No. 259).

This curious and very widespread coast species has the smallest flowers of any Indian species of bamboo yet known. Kurz, in his 'Report on the vegetation of the Andaman Islands', Calcutta, 1870, p. 75, says, "forming nearly half of the whole scandent vege-"tation in these jungles, and rendering many places nearly impenetrable." In that

work he called it *D. Tjangkorreh*, but he afterwards published the Andaman plant or a new species distinguished thus (see Journ. As. Soc. Beng. xlii. 249.) "spiculis multo "minoribus, pallidis (nec brunneis), foliis multo majoribus et ligulâ vaginarum differt." After careful examination of the specimens, however, I cannot think that the Andaman plant is anything more than a variety. Kurz gives the Andamanese name as *Baradahbarat*, and Ridley's Perak specimens bear the name *Bulu Akar*. *Tjankorreh* is the Java name.

PLATE No. 98.—*Dinochloa Tjangkorreh*, Büse. var. *andamanica*. 1, leaf-branch; 2, part of flower-panicle; 3, young culm-shoot to show culm-sheaths—*of natural size*; 4, spikelet; 5, empty glume; 6, palea; 7, stamen; 8, ovary; 9, caryopsis; 10 spinous branch node with persistent base of sheath—*enlarged*. (No. 3 from Kurz' figure in Herb. Royal Bot. Garden, Calcutta; Nos. 1 & 10 from Kurz' specimen; No. 9 from Munro's drawing; rest from specimens collected by the Novara Expedition: all except No. 9 from var. *andamanica*, the type being so well represented in Munro's plate.)

2. DINOCHLOA M'CLELLANDI, *Gamble*.

An evergreen, lofty, often scandent bamboo. *Culms* up to 100 ft. in height, if climbing; shorter and straggling if growing alone, 1 to 2 in. in diameter, zigzag geniculate, covered by the persistent loose sheaths, grey-green, walls ·2 to ·3 in. thick; nodes swollen; internodes 6 to 8 in. long, often angled especially when young, scabrous, with appressed brown pungent hairs. *Culm-sheaths* cylindrical, the base often dark, leathery, persistent, 6 to 9 in. long, 7 to 9 in. broad at base, 2 to 3 in. at top, covered with densely appressed golden brown pubescence, ending above in a narrow, ·1 in. broad, dark, glabrous margin, edging the whole of the truncate top outside the base of the imperfect blade; *imperfect blade* lanceolate acuminate, rounded at the base and decurrent on to the sheath, 6 to 12 in. long, 1 to 2·5 in. broad, recurved or spreading, glabrous outside, densely brown hairy within; *ligule* ·1 to ·2 in. broad, entire or very faintly serrate. *Leaves* large to very large, broadly oblong-lanceolate, acuminate, unequal at the base; rounded and decurrent into a broad thick petiole up to ·5 in. long; tip acuminate, setaceous, scabrous, twisted; retrorsely scabrous on one or both edges, glabrous on both sides; 6 to 18 in. long, 1 to 4 in. broad; main vein prominent, secondary veins 10 to 18 pairs, intermediate about 7, transverse veinlets many, conspicuous, oblique; *leaf-sheath* striate, transversely-veined, produced at the mouth into a rounded naked auricle, keeled at back, appressed-hairy when young, afterwards glabrous; *ligule* often broad, entire or serrate. *Inflorescence*, etc., unknown. D. MACLELLANDII, *Kurz in Journ. As. Soc. Beng.* xlii. 249; *For. Fl. Burma* ii. 371; BAMBUSA M'CLELLANDI, *Munro in Trans. Linn. Soc.* xxvi. 114.

Chittagong and Burma. Tropical forests of the Pegu Yoma and Martaban. Collected by Kurz, Brandis, P. J. Carter (No. 16), etc. Cultivated in the Royal Botanic Gardens of Calcutta and Peradeniya in Ceylon.

A handsome, well marked species, having all the characters of *Dinochloa*, as pointed out by Kurz. Called *Wanway* (climbing bamboo) in Burma.

PLATE No. 99.—*Dinochloa M'Clellandi*, Gamble. 1, leaf-branch; 2, large leaf; 3, top of shoot; 4, culm-sheath and portion of stem (from Calcutta Botanic Garden specimens).

13. Schizostachyum, *Nees.*

Arborescent or shrubby bamboos, usually erect, sometimes climbing. *Culms* smooth, usually slender, walls thin. *Culm-sheaths* shorter than internodes, cylindrical, furnished with small auricles and bearing a triangular or subulate *imperfect blade. Leaves* moderately broad to broad, petioled, smooth, without proper transverse veinlets. *Inflorescence* a terminal panicle of spicate branches, bearing heads of spikelets, often reduced to a spike of heads, which are sometimes very few; *rachis* slender. *Spikelets* slender, fasciculate in heads, usually pedunculate, or 2 or 3 together, often long, cylindrical, sometimes short. *Empty glumes* 1 to 3, narrow, separated by rachillæ from each other and from the flowering glume, usually mucronate. *Flowering glumes* 1 or 2, articulate below, much imbricate, convolute. *Palea* similar to flowering glume, not keeled, but often furrowed, sometimes bi-mucronate, closely convolute, bearing a terminal rudimentary flower on a long rachilla. *Lodicules* 0 to 4, usually 3, narrow, lanceolate, faintly ciliate. *Stamens* 6, exserted; *anthers* narrow, obtuse or apiculate or penicillate, filaments free. *Ovary* narrow, enclosed in a crustaceous pericarp which lengthens into a beak enclosing the *style,* which divides at the top into 3, short, plumose *stigmas. Caryopsis* (where known) ovoid, beaked, the beak bent to one side, enclosed in a crustaceous separate pericarp, seed rounded, embryo distinct.

Distrib.—Besides the five species herein described, there are about eleven others. One—*S. parvifolium,* Munro—occurs in Madagascar; another—*S. dumetorum,* Munro—in China; another—*S. glaucifoliun,* Munro—in the Pacific Islands; another—*S. acutiflorum,* Munro—in the Philippine Islands; and seven more, viz.—*S. elegantissimum,* Kurz, *S. Zollingeri,* Kurz, *S. brachycladum,* Kurz, *S. Irratun,* Steud., *S. longispiculatum,* Kurz, *S. serpentinum,* Kurz, and *S. Hasskarlianum,* Kurz—in Java and the neighbouring islands. Some of these may possibly be indigenous in the Indo-Malayan region, but I hesitate to include them without more information as to their true geographical distribution.

Analysis of the species.

Spikelets in heads in terminal simple spikes.
  Heads very few, 1 to 3 . . . . 1. *S. tenue.*
  Heads usually more than 3 . . . . 2. *S. chilianthum.*
Spikelets in heads in paniculate spikes.
  Spikelets short, under ·7 in. long . . . . 3. *S. Blumei.*
  Spikelets long, usually over 1 in. long.
    Glumes glabrous . . . . 4. *S. latifolium.*
    Glumes hairy . . . . 5. *S. aciculare.*

1. Schizostachyum tenue, *n. sp. Gamble.*

A graceful, small, climbing bamboo. *Culms* reed-like, thin. *Culm-sheaths* not known. *Leaves* linear-lanceolate, long-acuminate, 4 to 6 in. long, ·3 to ·6 in. broad; narrowed at the base into a rather long ·3 in. petiole; ending in a long setaceous twisted point; smooth and glabrous on both sides; edges very faintly scabrous, somewhat cartilaginous; main vein prominent, shining, secondary veins 3 to 5 pairs, intermediate

5 to 7, very distant transverse veinlets caused by pellucid glands; *leaf-sheaths* smooth, striate, truncate at the mouth with a broad callus; *ligule* very narrow. *Inflorescence* a terminal spike of 1 to 3 heads bearing few spikelets; *rachis* slender, curved; heads bracteate, with yellowish, mucronate, chaffy bracts. *Spikelets* narrow acuminate, about ·5 in. long, with 1 to 2 empty glumes, one fertile flower and a terminal small hairy imperfect flower; *empty glumes* ovate acute, mucronate, 5- to 7-veined; *flowering glume* similar but longer; *palea* longer than flowering glume, 2-keeled, the keels close together, glabrous, bi-mucronate. *Lodicules* 3, ·2 in. long, ovate-acute, thickened below, 3—5-nerved, somewhat hairy within. *Stamens* exserted; *anthers* linear, rounded at the top. *Ovary* narrowly oblong, surmounted by a long beak, enclosing, but rather longer than, the *style*; *stigmas* 3, purple plumose. *Caryopsis* not known.

Malaya: collected by H. N. Ridley in 1891, at Kwala Berar Pahang (No. 5596) and Bukit Toongul, Malacca (No. 5601). His specimen from Kota Tinggi, Johore, is also this probably, but has rather larger and longer leaves, reaching 9 in. in length and ·8 in. in breadth.

I cannot help thinking that this may be the plant described as *Schizostachyum elegantissimum*, Kurz in *Ind. Forester* i. 348=*Bambusa elegantissima*, Hassk. Pl. Jav. rar. 42=*Beesha elegantissima*, Kurz, Munro in Trans. Linn. Soc. xxvi. 146; but the specimens in the Calcutta Herbarium do not agree very well, and I have therefore preferred to describe it afresh. It is near *S. chilianthum*, but is much more slender and has fewer heads, often reduced to 1 only.

PLATE No. 100.—*Schizostachyum tenue*, Gamble. 1, leaf and flower branch—*of natural size;* 2, spikelet; 3, empty glume; 4, flowering glume; 5, palea; 6, lodicules; 7, anther; 8, ovary and beak with stigmas—*all enlarged* (from Ridley's Pahang specimens).

2. SCHIZOSTACHYUM CHILIANTHUM, *Kurz in Ind. Forester* i. 348.

A small, graceful, shrubby bamboo. *Culms* 6 to 8 ft. high, ·6 to ·8 in. in diameter, smooth, glossy; nodes not prominent; internodes fistular, glabrous, with the flower- and leaf-bearing branchlets semi-verticillate together at the nodes with many small bract-like sheaths, branchlets curved, slender, smooth. *Culm-sheaths* glabrous, smooth, ciliate on the edges, ending in a truncate mouth; *imperfect blade* erect, narrowly lanceolate, rounded at the base, hairy within and decurrent on the sheath in a long-fringed band ending in narrow auricles also long-fringed; *ligule* narrow, long-fimbriate. *Leaves* 6 to 10 in. long, ·7 to 1 in. broad, linear-lanceolate, long-acuminate; rounded or attenuate at the base into a ·2 in. long petiole; ending in a setaceous, twisted, scabrous point, sometimes even 1·5 in. long; somewhat rough above, pale and hairy on the midrib beneath, scabrous on the edges; main vein not prominent, secondary veins 4 to 6, intermediate 5 to 7, transverse veinlets formed by pellucid glands, few but conspicuous; *leaf-sheaths* striate, glabrous, ciliate at the edges, truncate at the mouth, with a narrow callus and short auricles, the mouth bearing long white (about 10) stiff deciduous bristles; *ligule* very short. *Inflorescence* a terminal spike of distant heads of spikelets, heads about ·5 in. broad, few, rarely more than 5 to 6; *rachis* very slender, somewhat angled, grooved, glabrous. *Spikelets* ·4 to ·6 in. long, very narrow, acuminate, with 1 fertile flower and sometimes a gemmiferous glume below and a terminal minute

imperfect one with long produced rachilla; *empty glumes* glabrous, striate, ovate-mucronate; *flowering glume* similar but longer; *palea* similar but bi-mucronate, keeled above only and furrowed. *Lodicules* 3, ovate-lanceolate or obovate, 3- to 5-veined, ciliate on the edges. *Stamens* exserted; anthers short, greenish, rounded at the tip (Munro says 'apiculate,' but I do not find them so). *Ovary* oblong, long-beaked, the *style* included in the beak; *stigmas* 3, short, exserted, purple plumose. *Caryopsis* ovate, long-beaked (·4 in. long, ·2 in. broad, beak ·5 in.), beak much bent to one side, surrounded by the persistent flowering glume and palea; *pericarp* crustaceous; *seed* rounded, embryo distinct. CHLOOTHAMNUS CHILIANTHUS, *Büse in Pl. Jungh.* 387; *Miq. Fl. Ind. Bat.* iii. 415. MELOCANNA GRACILIS, *Kurz, Munro in Trans. Linn. Soc.* xxvi. 133. BAMBUSA, *Wall. Cat.* 5032.

Malaya: collected at Batang, Malacca, by Mr. Vaughan Stevens (No. 3947 of Botanic Garden, Singapore); at Singapore by Wallich. Also in Java and Sumatra.

The Singapore specimens bear the name *Bulu rappen.* Kurz says it is *Bulu akar.* I have followed Kurz in identifying his *Melocanna gracilis* with *Chloothamnus chilianthus,* Büse, although Büse's description does not agree in all particulars. (See also note in Benth. and Hook. fil. *Genera Plantarum,* p. 1214.)

PLATE No. 101.—*Schizostachyum chilianthum,* Kurz. 1, leaf and flower specimen; 2, young shoots showing culm-sheaths—*of natural size;* 3, leaf-sheath; 4 & 5, spikelet; 6, flowering glume; 7, palea; 8, stamen; 9, lodicule; 10, ovary with beak and stigmas; 11, caryopsis; 12, do. section; 13, seed—*all enlarged.* (No. 4 from Kurz' drawing, No. 11 from Kurz' Java specimens, Nos. 12 & 13 from Kurz' Plate 2 in *Ind. Forester* i. 219; rest from Stevens' specimens.)

3. SCHIZOSTACHYUM BLUMEI, *Nees von Esenb. in Agrost. Bras.* 535.

An arborescent bamboo. *Culms* up to 30 ft. high, hollow, fragile, glabrous. *Culm-sheaths* cylindric, slightly attenuate to the truncate mouth with appressed white bristles, striate, mouth hispid, ciliate; *imperfect blade* leafy, erect; *ligule* narrow. *Leaves* 9 to 10 in. long, 1·2 to 1·8 in. broad, those of sterile branches up to 16 in. long and 2·5 in. broad, oblong-lanceolate; rounded or narrowed at the base into a ·3 to ·4 in. petiole; acuminate above in a subulate twisted point; rough on both surfaces, pubescent below scabrous on the edges; main vein narrow, secondary veins 5 to 6, intermediate 5 to 7; *leaf-sheaths* smooth, striate, keeled, mouth truncate and margins furnished with long, white, deciduous bristles; *ligule* short-fimbriate. *Inflorescence* a terminal panicle bearing clustered spikes with long spreading, erect or deflexed spikelets supported by chaffy bracts; *rachis* very thin, slender. *Spikelets* ·6 to ·7 in. long, very narrow, cylindrical, with 1 fertile flower; *empty glumes* 2, oblong, long mucronate, striate, glabrous, separated from each other and from the flower by ciliate rachillæ; *flowering glume* similar, but much longer; *paleæ* 1 or 2, inner membranous, not keeled, convolute. *Lodicules* none. *Stamens* exserted; *anthers* green, elongate, blunt. *Ovary* narrowly ellipsoid, glabrous, surmounted by a long beak, the *style* with 3 plumose *stigmas.* *Caryopsis* not seen. *Schultes Syst. Veg.* vii. ii. 1355; *Kunth Enum.* 435; *Rupr. Bamb.* 43 *t.* xvi, xvii. *fig.* 4; *Steud. Syn.* 332; *Miq. Fl. Ind. Bat.* iii. 424; *Munro in Trans. Linn. Soc.* xxvi. 136; *Kurz in Ind. Forester* i. 350. MELOCANNA TENUISPICULATA, *Kurz in Bot. Gard. Buit. and Calc.*

Malaya: collected by H. N. Ridley at Selitar, Singapore, in 1889. Also in Java up to 3,000 ft. (Kurz).

Kurz says that this is common in Java along rivulets in the hills, and that it is called *Bamboo irratun*. The specimens available are all so young that I have had to take part of the dissections from Ruprecht's excellent drawings of the spikelets. The Singapore specimens have narrower leaves than those from Java, but they may be from upper branchlets.

PLATE No. 102.—*Schizostachyum Blumei*, Nees von Esenb. 1, leaf- and flower-branch; 2, part of young culm with culm-sheath—*of natural size;* 3, pair of spikelets; 4 and 5, empty glumes; 6, flowering glume; 7, palea; 8. ovary and beak; 9, stamens. (No. 8 from Ruprecht's drawing; the rest from Kurz' specimen.)

4. SCHIZOSTACHYUM LATIFOLIUM, *n. sp. Gamble.*

Culms and *culm-sheaths* not known. *Leaves* 9 to 12 in. long, 1·5 to 2·5 in. broad, oblong, acuminate, rounded at the base into a ·3 in. long, broad, wrinkled petiole; ending above in a subulate, scabrous point; smooth on both surfaces and somewhat pale beneath, scabrous on the edges; main vein prominent below, secondary veins inconspicuous, 10 to 12 pairs, intermediate 5 to 6; *leaf-sheaths* striate, keeled, smooth, ending in a broad callus and large falcate auricle bearing long bristles; *ligule* short, long-ciliate. *Inflorescence* a terminal spicate panicle, 6 to 12 in. long, bearing clusters of spikelets mixed with ovate-lanceolate glabrous bracts; fertile spikelets in pairs or clusters, shortly pedicelled. *Spikelets* 1 to 1·4 in. long, long-acuminate, bearing 1 fertile flower and 1 terminal very small imperfect one; *empty glumes* 2, oblong, long mucronate, striate, separated by a short rachilla; *flowering glume* much larger, ovate-lanceolate, long-mucronate, convolute, often ciliate on the edges above; *palea* lanceolate, bi-mucronate, faintly keeled or channelled on the back, much convolute. *Lodicules* 3 to 4, the 3 ordinary ones lanceolate, 3—5-nerved, ·2 to ·3 in. long, very faintly ciliate, the fourth apparently a modified stamen, ·4 in. long. *Stamens* exserted; *anthers* long, narrow, blunt at the top, the connective produced into a penicillate point. *Ovary* glabrous, narrowly-lanceolate, surmounted by a long glabrous beak enclosing the *style* which bears 3 plumose *stigmas*. *Caryopsis* not known.

Malaya: collected by H. N. Ridley in 1891 at Kota Glanggi, Pahang (No. 5602).

I also identify with this his No. 5598 collected at Tanjong Autan, Pahang, and his No. 5600 collected at Sungei Hudang, Malacca, in 1891, but the flowering glumes are rather more ciliate, and I only find one lodicule. This species is near *S. longispiculatum*, Kurz *Ind. Forester* i. 351, but differs in the presence of lodicules and in the penicillate instead of glabrous, bifid, anther points.

PLATE No. 103.—*Schizostachyum latifolium*, Gamble. 1, leaf- and flower-branch—*of natural size;* 2, empty glume; 3, flowering glume; 4, spikelet with flowering glume removed; 5, palea; 6, lodicules; 7, anther; 8, ovary and beak with stigmas—*all enlarged* (from Ridley's No. 5602).

5. SCHIZOSTACHYUM ACICULARE, *n. sp. Gamble.*

A small bamboo. *Culms* and *culm-sheaths* not known. *Leaves* 6 to 9 in. long, 1·5 to 2 in. broad, ovate-oblong, almost elliptic, cuspidate, rounded or attenuate at the

base into a ·4 in. thickened pubescent petiole; ending in a blunt, scabrous, hairy point; smooth above except the scabrous points on marginal veins, smooth and slightly pale below; main vein hardly prominent, pale, secondary veins 10 pairs, inconspicuous, intermediate 5; *leaf-sheaths* smooth, ending in a round callus below the enlarged petiole and furnished at the mouth with a few long bristles; *ligule* short. *Inflorescence* a terminal spicate panicle bearing clusters of very long narrow spikelets; *rachis* 1 to 2 in., slender, flattened on one side; *bracts* few, short. *Spikelets* 1·2 to 1·5 in. long, very narrow, needle-like, on short bracteate peduncles, with 1 fertile flower and a terminal free rachilla and rudimentary flower; *empty glumes* 2, pubescent, oblong-mucronate, then a grooved, glabrous, short *rachilla*; *flowering glume* linear, much convolute, thick, covered with appressed hairs, long-mucronate; *palea* also much convolute, glabrous, mucronate, as long as flowering glume. *Lodicule* one only seen, narrow-lanceolate, glabrous. *Stamens* exserted; *anthers* very long, narrow, blunt and penicillate-apiculate. *Ovary* narrowly ovoid, glabrous, surmounted by a long glabrous beak enclosing the *style* which bears 3 short plumose *stigmas*. *Caryopsis* not seen.

Malaya: collected by Singapore Garden Collector, Mr. Alwis, at Rupayoong, Malacca, in 1885 (No. 2167).

I have seen only one sheet of this interesting species distinguished by the long needle-like hairy spikelets and short elliptic leaves. The specimen belongs to the Singapore Botanic Garden and bears the name *Bulu padi.*

PLATE No. 104.—*Schizostachyum aciculare*, Gamble. 1, flower- and leaf-branch—*of natural size;* 2, pair of spikelets; 3, spikelet without empty glumes; 4, palea; 5, lodicule; 6, anther; 7, ovary and beak and stigmas (from specimen No. 2167).

14. Melocanna, *Trin.*

Arborescent bamboos of moderate size, unarmed. *Culms* erect, singly from the ramifications of an underground stem, distant. *Culm-sheaths* often persistent, brittle, short, with short auricles, *imperfect blade* very long. *Leaves* broad, petioled, smooth, no transverse veinlets. *Inflorescence* a large compound panicle of spicate, one-sided spikelets. *Spikelets* 2 to 3, fasciculate in bracts in the axils of the spikes, acuminate, with one fertile and one or more sterile flowers. *Empty glumes* indefinite, acuminate, mucronate, striate. *Flowering glumes* similar to empty glumes. *Palea* also similar, convolute, not keeled. *Lodicules* 2, narrow. *Stamens* 5 to 7, filaments free or irregularly joined. *Ovary* glabrous, *style* elongate, *stigmas* 2 to 4, shortly hairy. *Caryopsis* very large, pear-shaped, long beaked; pericarp very thick.

Distrib.—One well-known species and another of imperfect identification. Of the four others described by Munro, one is a *Bambusa*, one a *Cephalostachyum*, and two belong to *Schizostachyum.*

1. MELOCANNA BAMBUSOIDES, *Trin. in Sprengel Neue Entd.* ii. 43 (1821).

An evergreen, arboreous bamboo, with single distant culms arising from the ramifications of an underground rhizome. *Culms* tall, green when young, straw-coloured when old, very straight, clothed with sheaths which persist for long, unbranched till near the top, 50 to 70 ft. high, 1·5 to 3 in. in diameter; nodes marked by a

thin ring only; internodes smooth, 12 to 20 in. long; walls thin, ·2 to ·3 in. *Culm-sheaths* yellowish-green when young, yellow when old, brittle, striate, covered with whitish appressed hairs, 5 to 6 in. long; 6 in. to 1 ft. broad at base, straight for about two-thirds of the way up, then once or twice waved, then cut off straight or concavely below the imperfect blade, the edges produced upwards into rounded, often long-fringed auricles; *imperfect blade* very long, often 1 ft., 1 inch broad at base, recurved, subulate, acuminate, the base decurrent in a narrow strip along the top of the sheath; *ligule* very narrow, serrate. *Leaves* from branchlets fascicled at the upper nodes of the culm, lanceolate or oblong-lanceolate, with a long scabrous, penicillate, hairy, twisted point; the base rounded and decurrent into a ·2 to ·5 in. petiole; 6 to 14 in. long, 1 to 1·5 and even 3 in. broad, glabrous above, glaucescent beneath, and hairy when young, both edges finely ciliate, but one edge scabrous, not only on the edge, but on the 2 or 3 adjoining nerves; main vein prominent, secondary veins 8 to 12, intermediate 5 to 6, inconspicuous, no regular transverse veinlets, but regular, rather distant, pellucid glands with bars between veinlets; *leaf-sheaths* glabrous, smooth, ending in a pointed auricle with 10 to 12 or more conspicuous, whitish, stiff, deciduous bristles, ·4 to ·6 in. long, margins ciliate; *ligule* very short. *Inflorescence* a large compound panicle of one-sided, drooping, spicate branches bearing clusters of 3 to 4 spikelets in the axils of short, blunt, glabrous bracts. *Spikelets* about ·5 in. long, glabrous, spinous; *empty glumes* 2 to 4, sometimes with abortive buds, striate, lanceolate, shortly mucronate; *flowering glume* similar, but thinner; *palea* glabrous, convolute, mucronate, acuminate, not keeled. *Lodicules* 2, narrow, linear-oblong, obtuse and erose-fimbriate at the tip, 3- to 5-nerved. *Stamens* free at the base or irregularly joined, filaments flat; *anthers* yellow, notched at the apex. *Ovary* ovoid, narrowed upwards into an elongated *style* which is divided into 2 to 4 hairy, recurved *stigmas*. *Caryopsis* very large, often 3 to 5 in. long and 2 to 3 in. broad, obliquely ovoid, fleshy, the beak curved; pericarp thick, fleshy. *Spreng. Syst.* ii. 113 (1825) (*excluding syn. Arundo maxima, Lour.*); *Rupr. Bamb.* 65; *Steud. Syn.* 331; *Miq. Fl. Ind. Bat.* iii. 423; *Munro in Trans. Linn. Soc.* xxvi. 132; *Kurz For. Fl. Burma* ii. 569. BAMBUSA BACCIFERA, *Roxb. Hort. Beng.* 25 (1814); *Corom. Pl.* iii. 38, *t.* 243 (1819); *Fl. Ind.* ii. 197. BEESHA RHEEDII, *Kunth Not. sur genre Bambusa in Journ. de Phys.* (1822); *Rev. Gram.* i. 141; *Enum.* 434 (*excl. syn*). BEESHA BACCIFERA, *Sch. Syst. Veg.* 1336. NASTUS BACCIFERA, *Rasp. in Ann. Sc. Nat. t.* v. 442.

Throughout Eastern Bengal and Burma from the Garo and Khasia Hills to Chittagong and Arracan, and again in Tenasserim.

In parts of the above region, and certainly in Chittagong, this is the most common species, and the one most universally employed for building purposes. Owing to its habit of sending out long underground rhizomes which give out culms at intervals, it spreads very rapidly and is extremely difficult to get rid of for cultivation. Ruprecht gives it as growing on 'dry sandy slopes on the hills of Coromandel,' but so far it has not yet been collected on the eastern side of the Bay of Bengal.

This interesting and handsome species is one of the most valuable and important of the Indian bamboos. From the Chittagong forests large numbers are yearly exported to Lower Bengal and, according to forest returns, about 16 millions are thus yearly required for building purposes in the Gangetic Delta. Although thin-walled, it is strong and durable, and it has the great advantage of being straight and having only very slight knots. It is recorded to have flowered and seeded in 1863 to 1866

(Munro Monog., p. 3), and as it was again in flower, at any rate in Assam, in 1892, it may be taken that its period is about 30 years. Roxburgh obtained flowering and fruiting specimens from his friend Richard Pierard, but the year is not mentioned (*Roxb. Cor. Pl.* iii. 38; *Fl. Ind.* ii. 197). Kurz records its having flowered in the Calcutta Botanic Garden, but gives no date; that flowering may have been in 1863 to 1866. Pierard, quoted by Roxburgh, says that it yields a large amount of tabasheer. It is locally known by the names *Múli*, *metunga* (Bengali); *Tarai* (Assamese); *Wati* (Cachari); *Artem* (Mikir); *Turiah* (Naga); *Watrai* (Garo); *Kayoungwa* (Magh) and is probably the Burmese *Kayinwa*. It is probably also the *Paía* (Bengali), *Aworja* (Chukma) of the list given at p. 130 of Major Lewin's 'Hill Tracts of Chittagong,' Calcutta, 1869. Major Lewin says the culm is of the best description, that white-ants do not touch it, that it flowered about four years ago (1865?), and that it is used for house walls, thatching and fancy basket-work. Roxburgh gives the Chittagong name as *Pagu-tulla*. The fruits occasionally germinate on the culm, sometimes making 6 in. growth before they drop (Kurz in *Ind. Forester* i. 268); some sent to Dehra Dun in 1892 germinated in the post and the plants are now growing well (1894).

TAB. No. 105.—*Melocanna bambusoides*, Trin. 1, leaf-branch with flowers showing stigmas; 2, part of flower-panicle—*of natural size;* 3, culm-sheath—*reduced;* 4, spikelet; 5, spikelet, opened to show lodicules, stamens and stigmas; 6, lodicule; 7, stamen—*enlarged;* 8 & 9, caryopsis—*reduced.* (Nos. 1, 2, 5, 8, 9, from Kurz' drawings in Calcutta Royal Botanic Garden Herbarium, the rest from Kurz' specimens.)

2. MELOCANNA HUMILIS, *Kurz For. Fl. Burma* ii. 569.

An evergreen, tufted bamboo. *Culms* 8 to 15 feet high, about 1 in. in diameter, very hollow; nodes hardly thickened; internodes about 1 ft. long. *Culm-sheaths* glabrous (?), cylindric, very short, rounded and inflated at the sinuate, much-produced mouth; *imperfect blade* linear, subulate-acuminate, erect, decurrent into a narrow, nude, green strip bordering the sinuses; *ligule* very narrow, entire. *Leaves* lanceolate to linear-lanceolate, obtuse at the base, on a petiole which is about 2 in. long; 4 to 6 in. long by ·7 to 1 in broad, very rough on one margin, glaucescent and minutely roughish pubescent beneath; secondary veins 8 to 10 pairs, very faint; *leaf-sheaths* glabrous, deciduously long-fringed at the minutely auricled mouth. Rest unknown (after Kurz).

Upper mixed forests of Arracan; Pazwoondoung valley near the village Wanet in Pegu.

Very little is known of this species; but, from the specimens of leaves and sheaths collected by Kurz, it would seem to be a *Melocanna*. It is characterized by its small size, by the leaves being roughish-pubescent beneath, and by the imperfect blade of the culm-sheath being erect. It ought not to be difficult to rediscover. Kurz gives the Burmese name '*Tabendeinwa*' on his specimens, but this is usually identified as *Bambusa villosula*. It is not clear how far this is connected with *Melocanna humilis*, Roepert in Trinius Clav. Agr. 105; Ruprecht Bamb. 64; Munro in Trans. Linn. Soc. xxv. 135, identified with Rumphius' *Arundarbor Cratium* and described as being 15 to 18 feet high with narrow lanceolate leaves, woolly beneath and bearing a wrinkled

caryopsis filled with dry white pith, and found in the Moluccas from Amboina to Java. Kurz himself says of this plant (*Indian Forester*, vol. i. p. 336)—"no one will "be able to identify it, unless he studies the Moluccan species on the classical ground."

PLATE No. 106.—*Melocanna humilis*, Kurz. 1, leaf-branch; 2, culm sheath (from Kurz' specimens).

Species of Melocanna *now referred to other genera.*

M. gracilis, Kurz	= *Schizostachyum chilianthum*, Kurz.
M. Kurzii, Munro	= *Bambusa schizostachyoides*, Kurz.
M. longispiculata, Kurz	= *Schizostachyum Blumei*, Nees.

15. Ochlandra, *Thwaites.*

Shrubby, gregarious, reed-like bamboos. *Culms* small, thin-walled, erect, with rather long internodes. *Culm-sheaths* thin, persistent on the culm, auricles small. *Leaves* like those of *Bambusa*, veins many, margins cartilaginous; *leaf-sheaths* striate, fringed; *ligule* short (in one species very long). *Inflorescence* a terminal spike or spicate panicle on a leafy branchlet, spikelets in verticels, partly fertile, partly sterile. *Spikelets* 1-flowered, often very large. *Empty glumes* 2 to 5, variable, usually mucronate. *Flowering glume* similar to last empty glume, also mucronate. *Palea* membranous, not keeled. *Lodicules* from 1 up to several, conspicuous. variable, usually appressed to the filaments. *Stamens* many, from 6 up to 120; *filaments* free or monadelphous, exserted; *anthers* long, narrow, usually mucronate. *Ovary* narrow, *style* elongated, *stigmas* 4 to 6, plumose, before opening either close together or twisted. *Caryopsis* large or very large, ovoid, long-beaked, supported by the persistent glumes; pericarp very thick, fleshy. BEESHA, *Munro in Trans. Linn. Soc.* xxvi. 144.

Distrib.—The seven species herein described belong: six to South India and Ceylon and one to the Malay Peninsula. No others are known, so far.

Analysis of the species.

Stamens many.
  Ligules short.
    Filaments free.
      Spikelets glabrous or merely pubescent.
        Leaves narrow . . . . 1. *O. Rheedii.*
        Do. broad . . . . 2. *O. stridula.*
      Spikelets hirsute . . . . 3. *O. Beddomei.*
    Filaments monadelphous, spikelets very large . . . 4. *O. travancorica.*
  Ligules long . . . . 5. *O. Brandisii.*
Stamens usually 6 . . . . 6. *O. Ridleyi.*
  Ligules short, flowers unknown . . . . 7. *O. setigera.*

1 OCHLANDRA RHEEDII, *Bth. and Hook. fil. Gen. Pl.*

A gregarious, shrubby bamboo. *Culms* erect, up to 16 ft. long, smooth; nodes somewhat raised; internodes about 17 in. long, 1 in. in diameter, bearing persistent

sheaths which occupy $\frac{1}{3}$ of the length of the internode, walls ·2 in. thick. *Culm-sheaths* 4 to 6 in. long, purplish-green, hairy when young, smooth striate when old, ciliate on the edges, rounded and truncate at the top and bearing 2 small falcate, long-ciliate auricles; *imperfect blade* subulate, acuminate, hairy within at the base; *ligule* short, ciliate. *Leaves* linear-lanceolate, 4 to 10 in. long, ·4 to 1·2 in. broad, the smaller ones most frequent; rounded at the base into a very short petiole; long-setaceous, scabrous-pointed above; smooth on both surfaces, except near the margins above where furnished with scabrous points, scabrous on one edge; main vein narrow, secondary veins 5 to 10 pairs, intermediate 6 to 7; *leaf-sheaths* smooth, furnished at the top with two falcate auricles fringed with stiff deciduous bristles; *ligule* very short. *Inflorescence* a short terminal or axillary spike or spicate panicle on leafy branchlets; fertile spikelets few, sub-solitary; sterile in heads, smaller; rachis smooth. *Spikelets* cylindric, sterile ·5 to ·7 in. long; fertile 1 to 1·2 in. long, both acute glabrous; *empty glumes* 2 to 3, many-veined, broadly ovate, acute, mucronate; *flowering glume* larger, sub-acute; *palea* convolute, not keeled, long-mucronate, membranaceous at the base. *Lodicules* many, about ·3 to ·5 in. long, oblanceolate or spathulate acute, glabrous, 1—7-nerved, persistent. *Stamens* many (15 to 18 or more), exserted; *filament* free, slender; *anthers* mucronate. *Ovary* oblong, surmounted by an enlarged perigynium containing the *style* which is cleft at the apex into 3 plumose *stigmas*. *Caryopsis* oblong, large, beak long. BEESHA, *Van Rheede Hort. Mal.* v. 119, tab. 60, (1685); BEESHA RHEEDII, *Kunth Enum.* i. 434 (1822) (excluding syn. except Rheede); *Ruprecht Bamb.* 65 (1839); *Munro in Trans. Linn. Soc.* xxvi. 144; *Beddome Flora Sylv.* ccxxiv. MELOCANNA RHEEDII, *Steudel Syn.* 332. BAMBUSA SCRIPTORIA, *Schleus.*, *fide Dillwyn in Index Hort. Malab.*

West Coast of India in Malabar, Cochin and Travancore. Collected by White, Johnstone (1836), F. W. Bourdillon, etc. Said by the latter to be "found only on river "banks in the wetter districts of Travancore."

This species, although it is two centuries since it was first described and excellently figured by Van Rheede, is very little known indeed, and I have not been able to secure fertile spikelets for examination, so that the plate only shews sterile ones. Van Rheede says that the culms were used in his time for making arrows, baskets and writing pens, and the leaves as a specific for toothache. Bourdillon says it is used for mat-making, and that it flowers annually, not dying down after flowering.

VAR. *sivagiriana*. Spikelets rather larger, stamens many (up to 50 to 60), leaves much larger generally. Sivagiri Hills, 4,000 to 4,500 ft., also Pulney Hills, 1873 (Beddome). (It is possible that this should have been described as a species.)

PLATE No. 107.—*Ochlandra Rheedii*, Bth. and Hook. fil. 1, leaf- and flower-branch bearing sterile spikelets; 2, culm and culm-sheath (young)—*of natural size;* 3, spikelet; 4 & 5, empty glumes; 6, flowering glume; 7, palea; 8, lodicule; 9, fruit-bearing spikelet; 10 caryopsis—*enlarged.* (No. 9 is from Van Rheede's figure; No. 2 is from Bourdillon's specimens; the rest after Johnstone's specimens.)

PLATE No. 108.—VAR. *sivagiriana.* 1, leaf- and fruit-branch; 2, part of flowering branch—*of natural size*; 3, spikelet; 4, 5, 6, empty glumes; 7, flowering glume; 8,

palea; 9, lodicules; 10, anther; 11, ovary; 12, caryopsis—*enlarged* (All from Beddome's specimens).

2. OCHLANDRA STRIDULA, *Thwaites Enum. Plant. Zeyl.* 376.

A close-growing gregarious shrub. *Culms* erect, 6 to 18 ft. high, about ·5 to ·7 in. in diameter, light green; nodes slightly marked by a ring, geniculate; internodes 12 to 14 in. long, with persistent sheaths, scabrous. *Culm-sheaths* cylindric, glabrous, purple when young, rounded at top and furnished on either side with small falcate auricles set with stiff white bristles; *imperfect blade* subulate, recurved, in small new shoots very long; *ligule* short. *Leaves* broad, oblong-lanceolate, 8 to 12 in. long by 1·5 to 2·5 in. broad; rounded at the base into a short broad petiole; ending above in a long, setaceous, scabrous point; smooth above, except near the margins, somewhat rough beneath; scabrous on one edge, edges somewhat cartilaginous and reflexed; main vein thin, secondary veins 10 to 12 pair, intermediate about 7, transverse veinlets none, but many pellucid glands having the appearance of oblique transverse veinlets on the under surface; *leaf-sheaths* striate, smooth when old, hirsute when young, ciliate at the edges, ending in a narrow callus and produced beyond the insertion of the petiole into round falcate auricles tipped with long, stiff, deciduous bristles; *ligule* narrow, glabrous. *Inflorescence* a laxly spicate terminal panicle, usually a leaf-bearing branchlet, the spikelets verticillate, few fertile, many sterile; rachis long, in joints, rough, glaucous above the joints. *Spikelets* 1 in. long, ·2 in. broad, cylindro-conical, with few scattered stiff hairs, one fertile flower; *empty glumes* 2 to 3, ·2 to ·5 in. long by as much broad, convolute, mucronate, ciliate on the edges; *flowering glume* similar but larger; *palea* membranaceous, truncate, not keeled, ·8 in. long, many-veined and with transverse veinlets. *Lodicules* 6 to 12 or more, lanceolate, various in breadth and with 1, 3, 5 or more veins (even 13 occur), convolute, appressed to the filaments, afterwards persistent around the fruit. *Stamens* very many, often 30; *filaments* free, flat, wavy in the upper half; *anthers* finally exserted, ·5 in. long, bifid at the apex and mucronate. *Ovary* narrow, smooth, the beak of the perigynium produced into a trigonous point enclosing the *style*, which is surmounted by 4 to 5 short plumose *stigmas*, at first twisted. *Caryopsis* ovoid, about 1 in. long, surmounted by a long 1 in. beak, smooth or wrinkled, supported by the persistent glumes, palea and lodicules. BEESHA STRIDULA, *Munro in Trans. Linn. Soc.* xxvi. 145; *Beddome Flora Sylv.* ccxxxiv.

Ceylon, very common in the low country in the south of the island.

This species is said by Dr. H. Trimen to flower annually and regularly. Thwaites says it is very abundant in Suffragam district, that the leaves make excellent thatch, and that it is called *Batta gass*. It is the C.P. No. 241. Trimen's specimens are from Deyandera; and in the Journal of Botany, 1885, he gives the name as *Rana batali*, and says that the species "covers hundreds of square miles of country in "the south and west of Ceylon."

PLATE No. 109.—*Ochlandra stridula*, Thwaites. 1, leaf- and flower-branch; 2, leaf-branch with sterile spikelets—*of natural size*; 3, base of leaf and leaf-sheath—*enlarged*; 4, young shoot with culm sheaths—*of natural size*; 5, apex of culm-sheath (under-surface); 6, spikelet; 7, spikelet and stamens; 8 & 9, empty glumes; 10, flowering glume; 11, palea; 12, lodicule; 13, ovary, style and stigma with stamens and appressed lodicules;

14, stamen; 15, ovary—*enlarged* (Nos. 4 and 5 from a drawing by W. D. Alwis kindly lent by Dr. H. Trimen; the rest from Thwaites' and Beddome's specimens.)

VAR. *maculata.* A gregarious slender bamboo. *Culms* densely tufted from much-branched, scaly rhizomes; greyish-green, elegantly mottled with irregular rings, bands and blotches of dark purplish claret colour; rest like the type. TEINOSTACHYUM ? MACULATUM, *Trimen in Journal of Botany,* 1885, 273.

Trimen says of this, "Forming jungle in several places in the districts of Amba-"gamuwa, Ruanwelle, and regions to the south-west of Adam's Peak." First collected by Mr. C. J. Ferguson on Galbodde Tea Estate, owing to attention having been drawn to articles ornamented with the mottled stems and exhibited in Colombo in 1883. The specimens I have seen, as well as Trimen's description and drawings, convince me that his suggestion to me, that his *Teinostachyum maculatum* is only a variety of *Ochlandra stridula,* is probably correct. Trimen says that specimens planted in the Royal Garden at Peradeniya "have nearly lost the mottling of their stems, and they will not flower."

3. OCHLANDRA BEDDOMEI, *n. sp. Gamble.*

Culms and *culm-sheaths* not known. *Leaves* oblong-lanceolate, 6 to 8 in. long, 1 to 1·5 in. broad; rounded unequally at the base into a ·2 in. long petiole; long-acuminate above with a twisted, scabrous, setaceous point; smooth above, except on the veins towards the edge, where scabrous; margins cartilaginous, revolute, one scabrous, smooth, and somewhat glaucous below; main vein narrow, secondary veins about 8 pairs, intermediate 6 to 7, transverse veinlets none; *leaf-sheaths* striate, minutely pubescent, ciliate on the edges, ending in a narrow callus, the mouth bearing a few erect stiff pale bristles near the petiole and much decurrent bristly-ciliate auricles at the sides; *ligule* very narrow. *Inflorescence* a short, terminal, spicate panicle at the apex of a leafy branchlet, the spikelets few together in short-bracteate verticils; rachis short, faintly pubescent. *Spikelets* 1 to 1·5 in. long, cylindric, conical, covered with scattered, stiff, bulbous-based, spreading, brown hairs, 2- to 3- bracteate at base; *empty glumes* 2, ovate, many-nerved, long-mucronate, hirsute, outer 7· in. long, inner longer; *flowering glume* 1·3 in. long, ovate-lanceolate, mucronate, glabrous, many-nerved; *palea* acute or blunt, very membranaceous, shorter than flowering glume, 1 in. long. *Lodicules* 5, all narrowly elongate, all different, one or two bipartite at the apex, ·6 to ·7 in. long and ·05 to ·1 in. broad, 3- to 7-nerved, glabrous or very faintly ciliate at the edges. *Stamens* many, about 32, exserted, filaments free; *anthers* narrow, straight, ·5 to ·6 in. long, bifid at apex and mucronate. *Ovary* glabrous, sub-orbicular, the beak of the perigynium produced in an angular style-sheath enclosing the *style* which is terminated by 5 to 6 plumose whitish *stigmas,* which before spreading out are close together in a narrow pencil. *Caryopsis* not seen.

Wynaad in South India.

Very little is known of this pretty species collected by Colonel R. H. Beddome in Wynaad. It is distinguished from *O. travancorica* by the free filaments and bifid apex of the anthers, and by the peculiar decurrent bristly auricle of the hairy leaf-sheath.

PLATE No. 110.—*Ochlandra Beddomei*, Gamble. 1, 2, 3, 4, leaf- and flower-branches—*of natural size*; 5, top of leaf-sheath; 6, spikelet; 7, empty glume; 8, flowering glume; 9, palea; 10, lodicules; 11, stamen; 12, ovary and style; 13, stigmas—*enlarged.* (All from Beddome's specimens.)

4. OCHLANDRA TRAVANCORICA, *Bth. in Bth. and Hook fil. Gen. Plant.* iii. 1215.

An erect, shrubby or arborescent, reed-like, gregarious bamboo. *Culms* 6 to 20 ft. high, grey-green, rough, 1 to 2 in. in diameter; nodes somewhat swollen and marked with the base of the fallen sheaths; internodes 1·5 to 2 ft., and longer (sometimes even 5 ft., *fide* Bourdillon), walls very thin, ·1 in. *Culm-sheaths* 6 to 8 in. long, thin, longitudinally wrinkled and striate, when young covered with many appressed golden or black bulbous-based hairs, glabrous when old, truncately rounded above and furnished with a fringe of erect, ·3 in. long, stiff bristles; ciliate on the margins; *imperfect blade* narrow, subulate, 1·5 to 3 in. long; *ligule* narrow, entire. *Leaves* broadly oblong-lanceolate, 6 to 18 in. long by 2 to 4·5 in. broad; rounded often unequally at the base into a thick, broad, somewhat concave, ·3 to ·4 in. petiole; apex long setaceous acuminate, often scabrous, twisted; both sides glabrous or slightly rough, edges scabrous, especially on one side, margin cartilaginous; main vein thick below, afterwards narrow, secondary veins 12 to 17 pairs, intermediate 6 to 8, no regular transverse veinlets, but frequent oblique pellucid glands which show as transverse veinlets on the under surface; *leaf-sheaths* striate, glabrous, keeled, ciliate on the edges, ending in a smooth, shining callus, and short fa'cate auricles, the mouth furnished with several, often 1 in. long, stiff bristles; *ligule* short, truncate. *Inflorescence* a sub-verticillate, spicate panicle with a few large fertile spikelets and a few much smaller sterile ones, in the axils of ovate-lanceolate, smooth bracts which bear subulate, deciduous imperfect blades. *Spikelets* ovate or oblong-ovate, 2 to 2·5 in. long, ·5 in. broad, glabrous, striate, supported by 2 to 4 small sheathing bracts; *empty glumes* usually 3, lowest smallest, 1·2 in. long, thick, concave, ovate, truncate at top and tipped with a subulate apex; the next similar but thinner and longer; the third again similar but 2 in. long and long acuminate, not truncate; all three many-veined and faintly transversely veined; *flowering glume* similar to the last empty glume; *palea* rather shorter and narrower, thinner in texture, acute, not mucronate, faintly 2-keeled. *Lodicules* 3, lanceolate, unequal, one 2-cleft, very membranaceous, ·5 to ·6 in. long, ·1 to ·2 in. broad, 3- to 7-nerved. *Stamens* very many, (up to 120), monadelphous, at first included, afterwards long exserted; *filaments* slender; *anthers* about ·1 in. long, narrow, long-hairy-apiculate. *Ovary* narrow, smooth, surmounted by a tri- or quadrangular perigynium enclosing the *style* which at the top is surmounted by 5 to 6 plumose *stigmas*, which are spirally twisted together. *Caryopsis* very large, 2 in. long, ·5 to ·6 in. broad, brown, oval-oblong, wrinkled and surmounted by a conical, stiff, 2 in. long beak; pericarp fleshy, enclosing the oval-elongate seed, the whole surrounded by the persistent glumes and palea. BEESHA TRAVANCORICA, *Beddome Flora Sylv.* ccxxxiv *tab.* cccxxiv.

Mountains of Southern India in Tinnevelly and Travancore at 3,000 to 5,000 ft. elevation; planted in Madras and at Peradeniya in Ceylon.

This is a magnificent and most interesting species, of which its discoverer, Colonel R. H. Beddome, late Conservator of Forests in Madras, says: "it covers many miles

"of the mountains often to the entire exclusion of all other vegetation; in open "mountain tracts it generally grows to 6 to 8 ft. in height, but most close and "impenetrable, elephants even not attempting to get through it; inside sholas and on "their outskirts it grows to 15 ft. high, and is much more straggling. It is called *Irúl* "by the natives and by Europeans the elephant grass." Mr. F. W. Bourdillon, Conservator of Forests in the Travancore State, who has kindly sent specimens of the leaves, culms, culm-sheaths and fruit, says also of it, "the *Eetta* or *irúl* reed is common up to 4,000 "ft. and also in the low country. The culms attain a height of 20 ft. in favourable "circumstances, with a circumference of 7 inches. The internodes are sometimes 5 ft. "long. It flowers almost every 7 years and dies down. It makes a splendid paper, and we "have a paper mill which uses it almost exclusively. The fibre has been pronounced "superior to 'Esparto.' Our only difficulty in connection with it is the great cost of "the chemicals required."

Brandis, writing of it under the name *Irakalli*, says "it covers immense areas on "the top of the ghats above Courtallum at 2,500 ft." He speaks of it again as climbing. Beddome expresses a doubt whether, considering the monadelphous stamens and the twisted stigmas, it should not form a new genus *Irulia*. As regards the stigmas, *O. stridula* has them also twisted, and as regards the monadelphous stamens the authors of the *Genera Plantarum* have not considered a new genus necessary, and note, what I find perfectly true, that the tube is '*facillime fissus*.' It is a very remarkable bamboo in respect of its long culm-internodes, and large flowers and fruit. Of stamens I have counted up to 120 in one spikelet!

VAR. *hirsuta*. The spikelets thickly clothed with light brown velvety pubescence; leaves thicker, their edges more cartilaginous; leaf-sheaths with appressed hairs with bulbous bases. Collected in 1869 by Beddome in the Travancore Hills.

PLATE No. 111.—*Ochlandra travancorica*, Bth. and Hook. fil. 1, leaf- and flower-branch; 2, culm-sheath—*of natural size*; 3, spikelet with bracts; 4, spikelets showing exserted stamens; 5, 6 & 7, empty glumes; 8, palea; 9, lodicules; 10, stamen; 11, ovary with style and stigma; 12 & 13, stigmas twisted and unrolled; 14, fruit—*all more or less enlarged*. (No. 2 from my own specimens; Nos. 12, 13, 14, from Beddome's figures; the rest from the sheet of Beddome's type in the Madras Museum Herbarium.)

PLATE No 112.—Var. *hirsuta*. 1, leaf- and flower-branch; 2, flower-branch—*of natural size* (from Beddome's specimens in the Madras Museum Herbarium).

5. OCHLANDRA BRANDISII, *n. sp. Gamble*.

Culm and *culm-sheaths* not known. *Leaves* oblong-lanceolate, acuminate, thick; 10 to 20 in. long, 1·5 to 3 in. broad; attenuated at the base into a short ·2 to ·3 in. broad petiole, which is wrinkled beneath; ending at the apex in a long, twisted subulate point; glabrous on both surfaces, whitish beneath, margins cartilaginous, smooth; main vein thick, prominent, secondary veins 10 to 13 pairs, thick, intermediate 5 to 7, no regular transverse veinlets, but pellucid glands which give the appearance of transverse veinlets on the lower surface; *leaf-sheaths* striate, ending in a smooth, rounded callus and produced at the mouth into short auricles fringed with a few stiff deciduous bristles;

ligule very long, 1 in. or more, membranaceous, acute. *Inflorescence* a verticillate, terminal spike with thick rachis, spikelets several in verticils in the axils of ovate, glabrous bracts. *Spikelets* glabrous, 1 to 1·5 in. long, ·3 to ·4 in. broad, conical, striate, supported at the base by 3 to 4 small chaffy scales; *empty glumes* up to 4, the two outer thicker, ovate truncate, with a subulate point; the other thinner, ovate acute, mucronate; all many-veined and glabrous; *flowering glume* thin, membranaceous, ·8 in. long, similar to last empty glume, many-veined and transversely veined; *palea* similar again but smaller. *Lodicule* 1, large, ·5 to ·6 in. long, ·1 to ·2 in. broad, many-nerved, truncate and retuse at the tip. *Stamens* many, up to 60; *filaments* short at first, afterwards elongated; *anthers* narrow, long-apiculate. *Ovary* glabrous, perigynium thickened, and enclosing *style* which is surmounted by 5 plumose *stigmas*. *Caryopsis* not known. BAMBUSA WIGHTII, *Munro in Trans. Linn. Soc.* xxvi. 111.

Tinnevelly Ghats in South India at Courtallum, up to 3,000 feet. Collected by Wight in 1835 (No. 1009) and by Brandis in flower in 1882.

I have no hesitation in considering Munro's *Bambusa Wightii*, of which the Calcutta Herbarium has a specimen with Munro's identification, to be this, and not, as Beddome supposed, *Teinostachyum Wightii*. The very long membranaceous ligules are mentioned with great stress by Munro, and are most characteristic. I am not quite sure about the lodicules, the material at my disposal being insufficient; but I believe I am right in thinking that there is only one, and that very large. The bamboos of Courtallum require further investigation very badly, and I feel sure that that place, probably one of the most interesting of the special botanical collecting grounds of India, if thoroughly studied, will give some important information regarding South Indian bamboos, especially of the genera *Ochlandra* and *Oxytenanthera*.

PLATE NO. 113.—*Ochlandra Brandisii*, Gamble. 1, leaf-branch; 2, part of flower-spike —*of natural size*; 3, spikelet; 4 & 5, empty glumes; 6, flowering glume (palea similar but smaller); 7, lodicule; 8, andro-gynœcium; 9, anther; 10, style and stigmas before opening; 11, stigmas opened out—*enlarged*. (All from Brandis' specimens.)

6. OCHLANDRA RIDLEYI, *n. sp. Gamble.*

Apparently a small species. *Culm* and *culm-sheath* not known. *Leaves* 9 to 10 in. long by 1 to 1·5 in. broad, oblong-lanceolate; rounded at the base into a broad, 2 in. long petiole; cuspidate acuminate at the tip, which is terminated by a subulate, setaceous, scabrous point; smooth above, except the scabrous points on the marginal veins, pale and slightly scabrous beneath, edges not, or only slightly, scabrous; main vein narrow, inconspicuous, secondary veins 10 to 12 pairs, intermediate 4 to 5; *leaf-sheaths* short, smooth, striate, ending in a narrow callus and bearing at the margins rounded or falcate, long-ciliate auricles; *ligule* short. *Inflorescence* a short (3 to 4 in.) terminal spike or spicate panicle on leafy branchlets, the flowers in somewhat distichous, bracteate heads, upper rachis very short; *bracts* ovate, truncate, fimbriate, with an ovate-acuminate imperfect blade. *Spikelets* several sterile, few fertile, about 1 in. long, bearing 1 to 2 empty glumes, then 1 to 2 fertile flowers and a short terminal rachilla; *empty glumes* ovate, truncate, long-mucronate, striate, covered with appressed hairs above; *flowering glume* similar but longer; *paleæ* two, not keeled: outer narrow, convolute, bi-mucronate, hairy near the tip; inner shorter, rounded

at top, glabrous, somewhat membranous. *Lodicules* 6 to 10, ·2 to ·3 in. long, usually lanceolate or spathulate, bluntly acute, many-nerved, ciliate above, sometimes forked. *Stamens* free or monadelphous, usually 6, sometimes one or two wanting, 3 longer blunt, 3 shorter acute at the produced connective. *Ovary* linear, narrow, surmounted by a long *style* and shortly plumose *stigma*, the whole enclosed in an enlarged perigynium which is 2- to 4-cleft at the tip. *Caryopsis* not known.

Malay Peninsula; collected by H. N. Ridley (No. 4620) and J. Feilding in 1892 at Bukit Mandai, Singapore.

The few stamens and the locality chiefly characterise this species which is the first that apparently has been found in the Eastern Peninsula. The Malay name is *Buluh kasap*.

Plate No. 114.—*Ochlandra Ridleyi*, Gamble. 1, leaf- and flower-branch—*of natural size*; 2, fertile spikelet with 2 to 3 sterile at base; 3, fertile spikelet (flowering glume removed); 4, flowering glume; 5, outer palea, 6, inner palea; 7, flower with paleæ removed showing style, with stamens and lodicules; 8, lodicules of various shapes; 9, stamens; 10, perigynium and stigma; 11, free terminal rachilla; 12, leaf-sheath—*enlarged* (from Ridley's specimens).

Species of which flowers are unknown.

7. Ochlandra setigera, *n. sp. Gamble.*

A small, tufted, erect or straggling, reed-like bamboo. *Culms* about 20 ft. high, ·5 to ·7 in. thick, very smooth, without branches below, much branched above; nodes hardly swollen; internodes 10 to 12 in. long, whitish below the nodes, walls ·1 to ·2 in. thick. *Culm-sheaths* persistent, 6 to 7 in. long, very thin, papery, striate; both longitudinally and transversely wrinkled near the top; sparsely covered with stiff appressed bristles, gradually attenuate to a very narrow (1 in. broad) apex; *imperfect blade* ·7 to 1 in. long, subulate, hair-like, edges incurved, hairy within; *ligule* very narrow, erose. *Leaves* oblong-lanceolate, acuminate, 6 to 9 in. long, ·8 to 1·2 in. broad; rounded at the base into a ·1 to ·2 in. long petiole; the tip somewhat broadened, scabrous hairy, followed by a twisted, scabrous, hair-like point; smooth above, minutely hairy beneath, scabrous on one edge; main vein narrow, secondary veins 6 to 7 pairs, intermediate 6 to 7, pellucid glands many; *leaf-sheaths* smooth, ending in short decurrent auricles fringed with long, stiff, curved bristles, one side shorter than the other; *ligule* very narrow. *Inflorescence*, &c., unknown.

Western slopes of the Nilgiri Hills, in ravines above Gudalur at about 3,000 ft.

This species somewhat resembles *O. Rheedii*, also *Arundinaria Prainii* and *Mannii*, in habit and appearance. The needle-hairlike imperfect blades to the papery sheaths are characteristic. I have only once met with it, but Dr. H. Trimen has sent sheaths extremely like those of this species and a picture from the Royal Botanic Garden, Peradeniya, as those of *O. travancorica*, which they certainly do not belong to. This may prove to belong to a new genus when the flowers are found, but I put it here at present because it has every appearance of being an *Ochlandra*.

Plate No. 115.—*Ochlandra setigera*, Gamble. 1, leaf-branch; 2, culm and culm-sheath; 3, imperfect blade of sheath, inside; 4, leaf-sheath—*enlarged*. (All from my own specimens.)

E J. H.—Reg No. 2868J—350—16-10-94.

APPENDIX

CONTAINING DESCRIPTIONS OF FOUR ADDITIONAL SPECIES.

Arundinaria Pantlingi, *n. sp. Gamble.*

An erect shrub. *Culms* tall, smooth, at least ·6 in. in diameter, slightly hairy below the nodes which bear a softly hairy ring formed by the base of the fallen sheath, internodes at least 7 to 8 in. long, cavity large. *Culm-sheaths* rather thick and tough about 10 in. long, smooth, striate, long-ciliate on the edges, gradually tapering upwards roundedly to a convex top about ·6 in. broad; *imperfect blade* erect, subulate, 3 to 4 in. long, ·2 to ·3 in. broad, glabrous on both sides, decurrent on the apex of the sheath into rounded softly hairy auricles furnished with a few (6 to 10) long curved bristles; *ligule* about ·1 in. broad, prominent, faintly ciliate, dentate, pubescent on the back. *Leaves* oblong-lanceolate, long acuminate, 5 to 7 in. long, ·6 to ·8 in. broad, narrowed at the base into a ·2 to ·3 in. long petiole; tip ending in a long twisted scabrous point; smooth above, rather rough beneath, very scabrous on one margin; main vein pale, shining, narrow, secondary veins 4 to 5 pairs, intermediate 7 to 9; transverse veinlets very many, raised, straight or slightly oblique, about 60 to 70 to the inch; *leaf-sheaths* striate, glabrous, long-ciliate on the edges, ending in a very hairy ring furnished on either side with a few long twisted bristles; *ligule* rather long glabrous, pubescent on the back. *Inflorescence* of short 4 to 6 in. long panicles, terminal and axillary on leafless branches, supported by glabrous sheathing bracts like small culm-sheaths, the spikelets on long wavy capillary glabrous pedicels, glandular at the nodes and somewhat verticillately arranged. *Spikelets* 2 in. or more long, curved, very narrow, with 2 empty glumes and 6 to 10 flowers, the uppermost 2 to 4 usually empty; rachillae about ·3 in. long, clavate, white-pubescent, ending in a tuft of white hairs below the flowers; *empty glumes* 2, lower ·2 in., upper ·4 in. long, 3- to 5-nerved, ovate-acuminate, mucronate, slightly ciliate; *flowering glumes* similar to upper empty glume but slightly longer, long mucronate, nerves 7, prominent, midrib scabrous; *palea* as long or rather longer than flowering glume, 2-keeled, ciliate on the keels, 1 nerved between them and 1-nerved on either side, bifid at the apex and bi-mucronate. *Lodicules* 3, obovate or ovate acute, faintly nerved and ciliate. *Stamens* 3, filaments short; anthers slightly exsert, linear, acute. *Ovary* glabrous, brown gradually produced into a short often curved style, early divided into three long-plumose stigmas. *Caryopsis* oblong, dark-brown, grooved, surmounted by the persistent base of the style.

Hills of British Bhutan, on Rechi Lá, at 11,000 feet.

This interesting species was discovered by Mr. R. Pantling's collectors in September 1895. The collectors had been sent to look for specimens of a bamboo which, in an

abstract of a paper read at the Oxford meeting of the British Association, 1894, published in the Scottish Geographical Magazine, Vol. X, p. 635, by Lieutenant-Colonel H. H. Godwin-Austen, had been mentioned as possessing thorns at the nodes of the culms. Such a bamboo was found; its spines were short on the upper part of the culms, and on the lower part were replaced by long, regular, aërial roots. It proved to be *Arundinaria Griffithiana*, Munro. With these two were also found flowering specimens of *Arundinaria aristata*, Gamble. *A. Pantlingi* is a very interesting species, whose exact position it is difficult to locate. The specimens received are all apparently from leafless culms and bear no trace of spines; otherwise it would come next to *A. Griffithiana*, from which it markedly differs in having different culm-sheaths, larger leaves, longer spikelets, and no hairs to the tips of the anthers. In the capillary pedicels with glandular bases it resembles *A. Wightiana* and *A. floribunda*, while in the structure of the flowers it comes near to *A. racemosa*. But on the whole its nearest relation seems to be *A. Griffithiana*, and if, as is surmised to be the real case, it bears flowers on leafy branches and spinous nodes, it will come next to it in the analysis, differing in the characters mentioned.

PLATE No. 118.—*Arundinaria Pantlingi*, Gamble. 1, leaf-branch; 2, flowering branch—*of natural size*; 3, culm-sheath—*reduced*; 4, spikelet; 5, 6, empty glumes; 7, flowering glume; 8, palea; 9, lodicules; 10, stamen; 11, ovary and stigmas (young); 12, ditto, old; 13, caryopsis; 14, leaf-sheath—*enlarged* (all from Mr. Pantling's specimens).

ARUNDINARIA ARMATA, *n. sp. Gamble.*

An evergreen shrubby bamboo with single stems arising at intervals from a creeping rhizome. *Culms* green, straight, smooth, very thin-walled, 1 to 1·8 in. in diameter and about 20 ft. high; nodes little raised, bearing in a ring below them a belt of straight smooth spines; internodes about 8 in. long. *Culm-sheaths* thin, papery, striate, 6 to 8 in. long, 2·5 to 3 in. broad at base, tapering convexly upwards to a very narrow ·1 to ·2 in. top, smooth above or with a few scattered stiff hairs on the upper half, ciliate on the edges; *imperfect blade* exceedingly small, about ·1 in. long, triangular, pubescent; *ligule* very narrow, ciliate. *Leaves* bright green, oblong-lanceolate, long-acuminate, 6 to 9 in. long by ·8 to 1·2 in. broad, narrowed at the base into a ·1 to ·2 in. long petiole; tip subulate, twisted, scabrous; smooth above, slightly rough beneath, scabrous on the margins; main vein narrow, pale, shining, pubescent above, secondary veins 6 pairs, intermediate 5 to 7, transverse veinlets numerous, raised, irregularly spaced; *leaf-sheaths* striate, ending in small calluses and bearing few (about 10 to 12) straight stiff bristles; *ligule* very short, ciliate. *Inflorescence*, &c., unknown.

Hills of Upper Burma, at 5,500 feet, Bernardmyo.

I am indebted for specimens of this species to Mr. J. W. Oliver, Conservator of Forests, who found it in February 1894. It comes near to *Arundinaria callosa*, Munro, but is quite distinct from that species. It is called *Maitut* by the Shans.

PLATE No. 119.—*Arundinaria armata*, Gamble. 1, leaf-branch; 2, culm-sheath—*of natural size*; 3, part of node of culm; 4, leaf-sheath—*enlarged* (all from J. W. Oliver's specimens).

BAMBUSA OLIVERIANA, *n. sp. Gamble.*

A moderate-sized tufted bamboo. *Culms* glossy-green, sometimes covered when young with whitish scurf, 40 to 45 ft. long, 1 to 2 in. in diameter; internodes

about 14 in. long, branches many from the base upwards. *Culm-sheaths* thin, pale, 8 to 10 in. long, 4 to 5 in. broad, striate, attenuated upwards into a rounded top 2 to 3 in. broad; glabrous on both sides, or only slightly hirsute on the back when young; *imperfect blade* triangular-lanceolate, cordate at the base, 4 to 8 in. long, 2 to 3 in. broad, both sides covered with scattered stiff brown hairs; produced at the base into short long-fringed auricles, that on one side rounded about ·1 to ·3 in. long, that on the other decurrent, often 1 in. long; *ligule* about ·1 in. broad, serrate. *Leaves* small, linear, thin, 4 to 7 in. long, ·4 to ·6 in. broad; attenuated or rounded or sometimes abruptly rounded at the base into a ·1 to ·15 in. long petiole, ending above in a long twisted needle-like point, glabrous on both surfaces, minutely scabrous on the edges; main vein pale, secondary veins 4 to 5 pairs, faint, intermediate 7; *leaf-sheaths* glabrous, striate, ending in an emarginate callus and slightly produced at the edges to meet the rather long *ligule*. *Inflorescence* a much-branched panicle of drooping one-sided spikes with rather distant bracteate clusters of few (1 to 3) spikelets; *bracts* glabrous, striate, truncate; *spikelets* flattened, ·5 to ·6 in. long, straw-coloured or greenish, glabrous; *empty glumes* 1 to 2, ovate-lanceolate, veined; then 3 to 4 distichous fertile flowers separated by conspicuous rachillæ; terminal flower imperfect on a long flattened glabrous rachilla; *flowering glume* ovate-lanceolate, acuminate, 9-nerved; *palea* rather shorter, 2-keeled, acute, glabrous, except for a minute tuft of hairs at the apex, 3-nerved between, 3-nerved on either side of the keels. *Lodicules* 3, rounded, obtuse, long-fimbriate, many-nerved. *Stamens* long—exsert, anthers striped red and yellow at first, afterwards dull purple, obtuse. *Ovary* ovate, elongate, hairy; *style* short, soon dividing into 2 plumose *stigmas*. *Caryopsis* ovate, ·3 in. long, furrowed on one side, slightly hairy at top.

Upper Burma; found by J. W. Oliver about 30 miles north of Mandalay at from 1,000 to 2,000 ft., 1893-94; also sent by Mr. C. S. Rogers from the Ruby Mines Hills.

This must be a very pretty graceful species. J. W. Oliver writes:—"The bamboo "is called locally *Wapyusan*. It is found in fairly moist deciduous forest. It grows in "patches, generally occupying dry ravines. The flowering appears to be general, and "the ground and undergrowth near the flowering patches were covered with a dense "layer of pollen dust." The striped anthers are very characteristic even in dry specimens. It belongs to section II, between Nos. 12 and 13—"Fertile flowers 3 to 4. "Anthers obtuse, keel of palea not ciliate." Large quantities of the seed have been collected and distributed, so the species is likely soon to be well known. The absence of ciliæ to the keels of the palea and the small leaves ally it to *B. polymorpha*, but the one-sided spikes and the quite different culm-sheaths distinguish it at once.

Plate No. 116.—*Bambusa Oliveriana*, Gamble. 1, leaf-branch; 2, part of flower panicle; 3, culm-sheath—*of natural size*; 4, spikelet with bract; 5, spikelet; 6, flowering glume; 7, palea; 8, lodicule; 9, anther; 10 ovary, with style and stigmas; 11, caryopsis; 12, germinating seed—*enlarged*. (All from J. W. Oliver's specimens.)

Dendrocalamus latiflorus, *Munro in Trans. Linn. Soc.* xxvi. 152, *Tab.* vi.

A very large bamboo. *Culms* tall, 5 in. in diameter, cavity large; internodes short, striate, glabrous. *Culm-sheaths* similar to those of *D. giganteus*, 10 to 12 in. long by about the same in breadth, dark brown when dry and old, thinly covered with black appressed stiff hairs; *ligule* ·2 in. long, dentate. *Leaves* broadly oblong-lanceolate,

rounded at the base into a short petiole, long acuminate, glabrous but rather rough above, minutely pubescent near the base beneath; rough on the margins, 7 to 10 in. long by 1·2 to 3 in. broad; main vein prominent; secondary veins 6 to 9 pairs, rather conspicuous, intermediate 8 to 9; transverse veinlets frequent, not conspicuous; *leaf-sheaths* striate, glabrous or hairy between the lines with longish hairs ending in an emarginate callus and produced somewhat at the sides beyond the ligule, ciliate on the margins; *ligule* obtuse, truncate, rarely fimbriate. *Inflorescence* a large compound reddish-purple panicle, bearing spikelets in clusters of 3 to 6, or 1 only on uppermost parts, on spicate branchlets, uppermost spikelets followed by leaf-like bracts 1 to 1·5 in. long; rachis softly hairy, ·4 to ·7 in. long, flattened on one side and white-ringed above. *Spikelets* ovate-oblong, ·6 to ·8 in. long, ·3 to ·4 in. broad, flattened conspicuously, pubescent; *empty glumes* 2, short, broad, acute, ·2 in. long, ciliate on the edges, many-veined; then 6 to 8 flowers, of which the lowest and uppermost are sometimes sterile; *flowering glume* broadly ovate at the base, about half way up narrowed to a rather blunt point, ·4 in. long, dark-coloured and ciliate on the edges, pubescent on the back, many-veined and transversely veined; *palea* a little shorter than the flowering glume, narrow, 2-keeled, ciliate on the keels, acute and often bifid at the tip, 3-veined on the back. *Stamens* long exserted, anthers pale, ending in a hairy mucro. *Ovary* ovate from a broad base, pubescent, surmounted by a long hairy *style* ending in 1 to 2 short purple *stigmas*. *Caryopsis* not known. BAMBUSA VERTICILLATA, *Benth. in Fl. Hongk.* 434, *fide Munro.*

Southern Shan States, Upper Burma, collected by Dr. G. King's collectors at Laikaw in 1894. Also by J. W. Oliver in a garden at Maymyo Fort near Mandalay in 1895. Also in China and Formosa.

Neither in Munro's monograph nor in the Hongkong Flora are the indications of the size of this species at all satisfactory. To judge by the inflorescence and the analogy of its neighbours *D. giganteus* and *D. calostachyus*, and from J. W. Oliver's notes, it has every probability of being a very large kind, though not nearly so large as *D. giganteus.* Bentham says it is planted by the Chinese in China and probably also in Hongkong. At Maymyo it is called *Wa-ni*, Burm. (the red bamboo) from its conspicuously reddish flowers. He thinks that the Maymyo plants were introduced from China as the Fort was built by the Chinese. It should come in the *Analysis* after No. 9— "Spikelets reddish, long, ovate-oblong, flattened."

PLATE No. 117.—*Dendrocalamus latiflorus,* Munro. 1, part of leaf branch; 2, 3, parts of inflorescence; 4, spikelet; 5, 6, one flower with and without flowering glume, showing palea, stamens and ovary—*of natural size*; 7, empty glume; 8, flowering glume; 9, ovary with style and stigma—*enlarged.* (All but 7 and 8 from Fitch's Plate in Munro's Monograph.)

On page 110, *Cephalostachyum virgatum*, Kurz, line 1, *for* "a sub-arboreous bamboo; *culms*, *culm-sheaths* and *leaves* unknown" *substitute the following*:—

"A medium-sized slender tufted bamboo. *Culms* dark-green, erect, covered with whitish scurfy down when young, up to 4 in. in diameter; nodes not thickened; internodes 18 to 24 in. long, regular, walls thin. *Culm-sheaths* much shorter than the internodes, 6 to 8 in. long, 7 to 10 in. broad at base, pale, covered with stiff appressed golden hairs, curvedly attenuate upwards to a horizontal or slightly depressed top 4 to 5 in. broad; *imperfect blade* 4 to 5 in. long, usually recurved, cordate at base, where 1 to 1·5 in. broad, cuspidately narrowed to a sharp point, margins incurved, glabrous

above, covered beneath with dense appressed stiff hairs, decurrent along the top of the sheath in a narrow, straight band, bordered with stiff curved bristles; *ligule* narrowed, fimbriate. *Leaves* rather variable, thin, oblong-lanceolate to linear-lanceolate; 6 to 12 in. long by 1·2 to 1·8 in. broad, rounded at the base into a thick ·2 in. long hairy petiole, which is swollen into a large callus below; above cuspidately acuminate with a scabrous point scabrous on the margins and rough on both sides, pale beneath and slightly pilose especially on the midrib; main vein conspicuous, pale, broad, hairy below, secondary veins 10 pairs, intermediate 5 to 7, transverse veinlets very few; *leaf-sheaths* smooth, striate, keeled, ending in a narrow ciliate callus and bearing short auricles furnished with a few white stiff bristles; *ligule* very short, fimbriate."

Page 111, line 10. *Add*: "Found recently (March 1895) by Mr. J. W. Oliver in evergreen forest near the Indawgyi lake, Bhamo district, Burma, where its native name is *Waba*, Burm. Also, by the same, in February 1895, in leaf only, near Mohnyin under the Kachin name *Lakra*."

Page 111, line 18, at end. *Add*: "11, leaf-branch—*natural size*; 12, culm-sheath —*reduced about* $\frac{1}{4}$; 13, top of leaf-sheath—*enlarged* (from Mr. J. W. Oliver's specimens)."

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E. J. H.—Reg. No. 2868J—350—7-3-96.

Ann. Roy. Bot. Garden, Calcutta, Vol. 7, PLATE 1.

Lith by P. N. Sinha.

ARUNDINARIA WALKERIANA, Munro.

Drawn by K. P. Dass.

Lith: by K. P. Dass.

ARUNDINARIA WIGHTIANA, Nees.

Drawn by G. C. Dass.

Lith by A. L. Singh.

ARUNDINARIA FLORIBUNDA, Thw.

Drawn by

ARUNDINARIA

Lith. by … M…

ARUNDINARIA POLYSTACHYA, Kurz

Lith. by B. K. Roy

ARUNDINARIA DENSIFOLIA, Munro.

Drawn by M. [illegible]

Lith. by [illegible]

ARUNDINARIA RACEMOSA, Munro.

ARUNDINARIA GRIFFITHIANA, Munro.

Drawn by M. Ghosh

ARUNDINARIA CALLOSA, Munro

Lith. by S. C. Mondal

Drawn by M. Idrees.

Lith: by A. C. Chowdhary.

ARUNDINARIA FALCATA, Nees.

Drawn by M. Idrees.

ARUNDINARIA FALCATA, Nees
VAR. glomerata.

Drawn by M. Idrees. Lith: by P. N. Sinha

ARUNDINARIA KHASIANA, Munro.

Drawn by M. Idrees.

Lith: by P. N. Sinha.

ARUNDINARIA INTERMEDIA, Munro.

Drawn by A. L. Singh.

ARUNDINARIA HOOKERIANA, Munro.

ARUNDINARIA

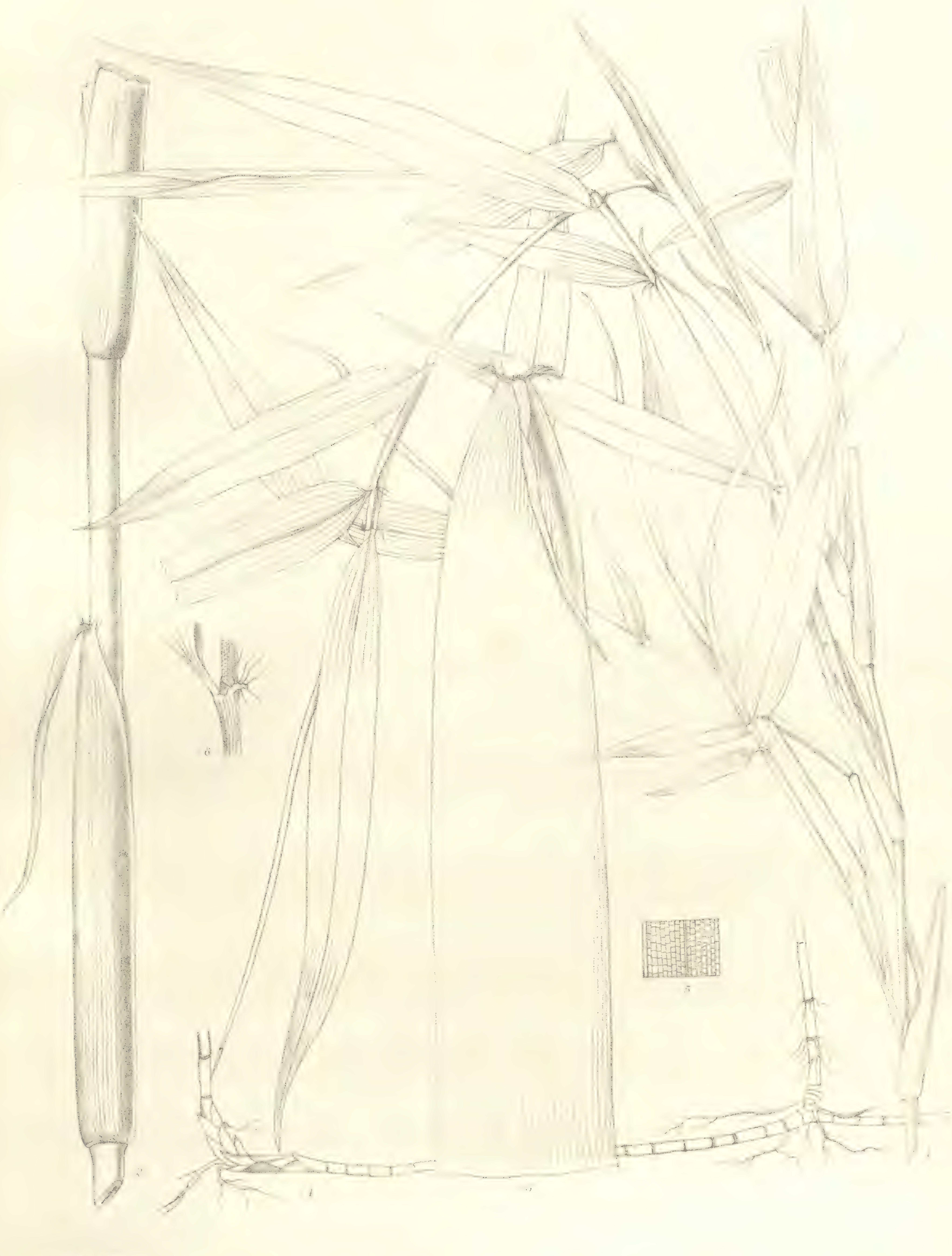
ARUNDINARIA ARISTATA, Gamble.

ARUNDINARIA FALCONERI, Benth. and Hook. f.

ARUNDINARIA PRAINII, Gamble.

ARUNDINARIA HIRSUTA, Munro

Lith. by A. ... Ghosh



Drawn by Hormusji.

Lith: by K. P. Dass.

ARUNDINARIA JAUNSARENSIS, Gamble.

Drawn by M. Idrees.

ARUNDINARIA ROLLOANA, Gamble

Lith by K. P. Dass.

ARUNDINARIA SUBERECTA, Munro.

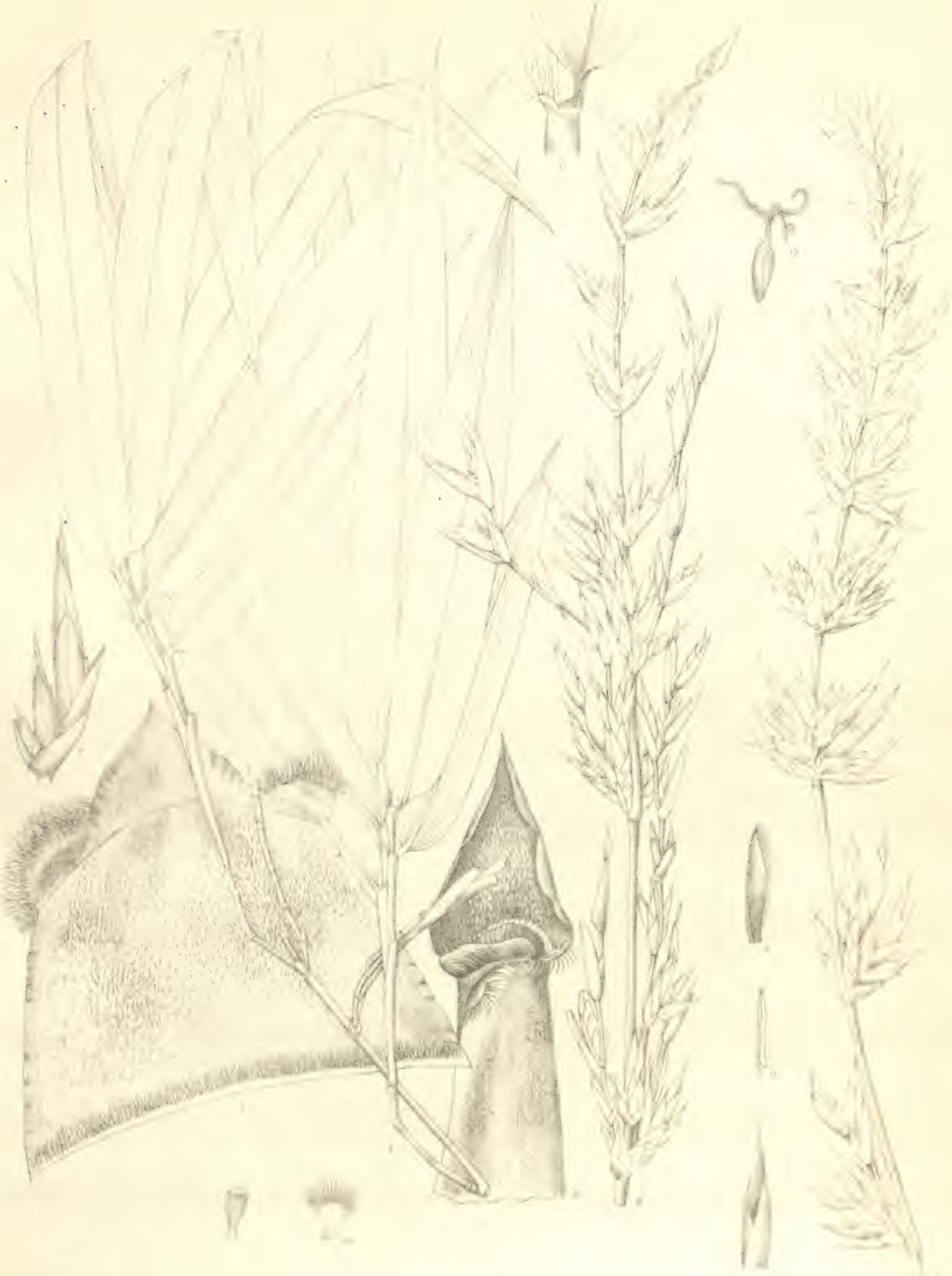
ARUNDINARIA KURZII, Gamble

ARUNDINARIA MANNII, Gamble

PHYLLOSTACHYS BAMBUSOIDES Sieb. et Zucc.

PHYLLOSTACHYS MANNII, Gamble.

BAMBUSA TULDA, Roxb.



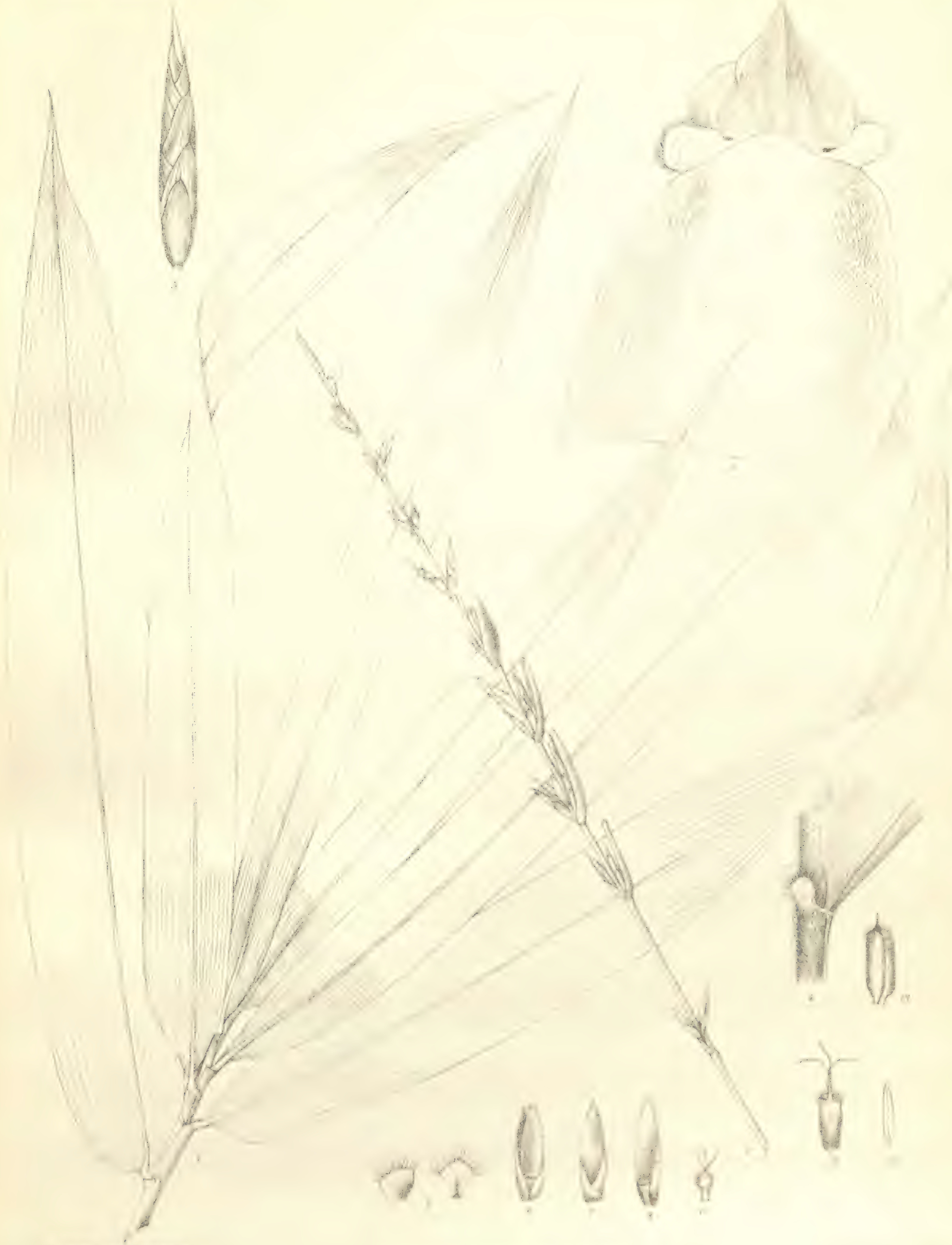
BAMBUSA NUTANS, W

Drawn by A. D. Mulna. Lith. by K. P. Dass

BAMBUSA TERES, Ham.

Lith. by A. L. Singh.

BAMBUSA RIDLEYI, Gamble.



Drawn by Hermasji

Lith: by G. C. Dass

BAMBUSA BURMANICA, Gamble.

Drawn by M. Idrees.

BAMBUSA POLYMORPHA, Munro.

Lith. by K. P. Dass.

Drawn by A. L. Singh.

Lith by A. L. Singh.

BAMBUSA PALLIDA, Munro.

Lith. by A. D. Mella

Lith: by A. D. Molla.

BAMBUSA KHASIANA, Munro.

Drawn by M. [illegible]

Lith by D. N. Chowdhury

BAMBUSA NANA, Roxb.

BAMBUSA BALCOOA, Roxb.

Drawn by M. Idrees. BAMBUSA VULGARIS, Wendl. Lith. by K. P. Dass

Drawn by K. P. Dass

BAMBUSA BINGHAMI, Gamble.

Lith. by G. C. Dass.

Lith: by A. D. Molla.

BAMBUSA LINEATA, Munro.

Drawn by M. Idrees.

Lith: by A. L. Singh.

BAMBUSA SCHIZOSTACHYOIDES, Kurz.

Drawn by A. D. Molla.

Lith. by A. D. Molla.

BAMBUSA GRIFFITHIANA, Munro.

Ann. Roy. Bot. Garden, Calcutta, Vol. 7, PLATE 46.

Drawn by A. D. Malla.

Lith by G. C. Dass.

BAMBUSA WRAYI, Stapf.

Ann Roy. Bot. Garden, Calcutta, Vol 7, PLATE 47.

Drawn by A. L. Singh.

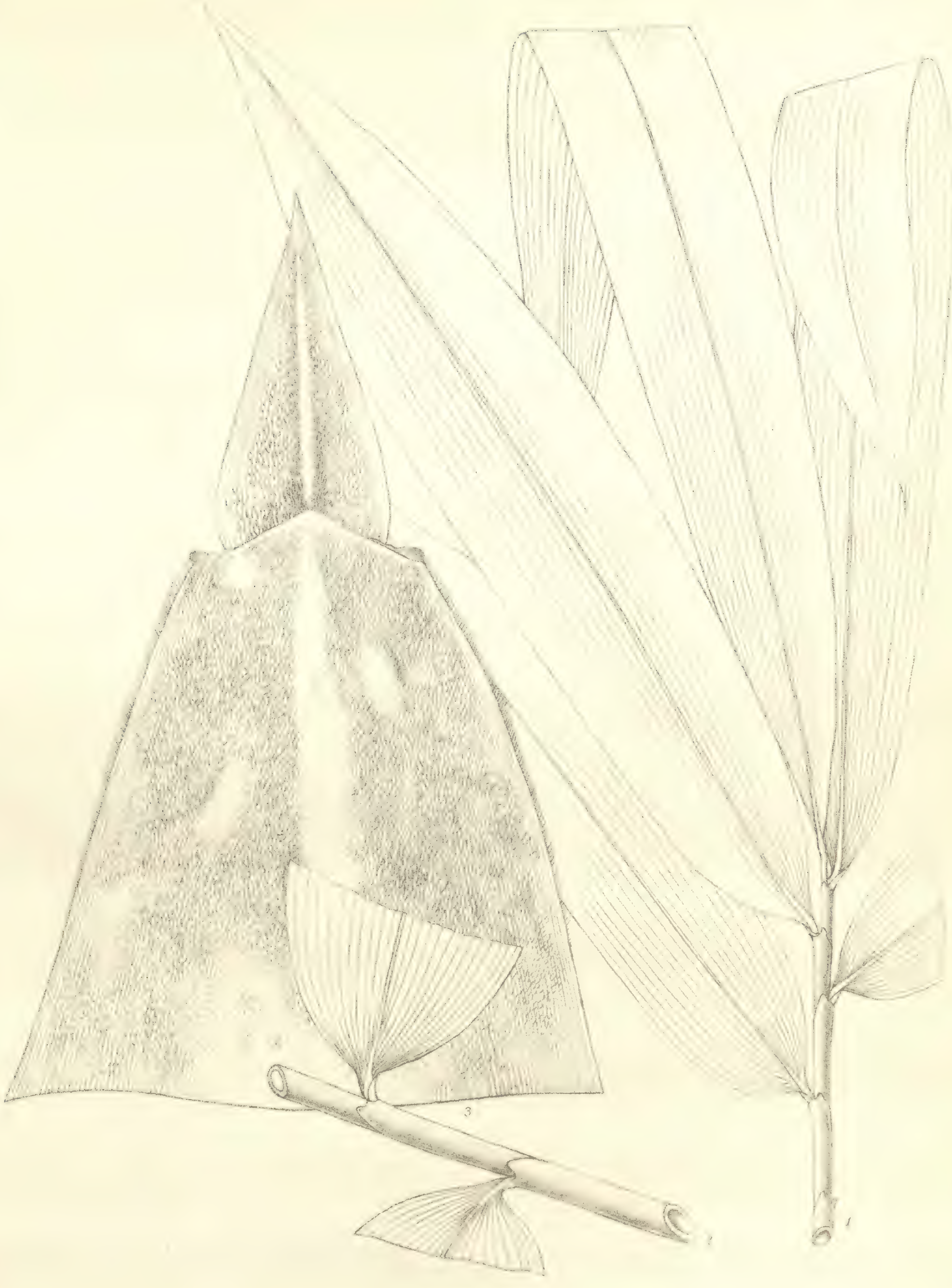
Lith. by K. P. P.

BAMBUSA BLUMEANA, Schultes.

Drawn by M. Idrees.

Lith by D. N. Chowdhury

BAMBUSA ARUNDINACEA, Retz.



Drawn by M. Idrees.

Lith: by C. C. Dass.

BAMBUSA AURICULATA, Kurz.

Drawn by Heeraasj.

Lith: by A.L. Singh.

THYRSOSTACHYS OLIVERI, Gamble.

Drawn by K. P. Dass.

Lith. by K. P. Dass.

THYRSOSTACHYS SIAMENSIS, Gamble.

[illegible]

GIGANTOCHLOA VERTICILLATA, Munro.

Lith: by K. P. Dass

Drawn by M. Idrees.

Lith: by A. D. Molla.

GIGANTOCHLOA SCORTECHINII, Gamble.

Drawn by M. Idrees.

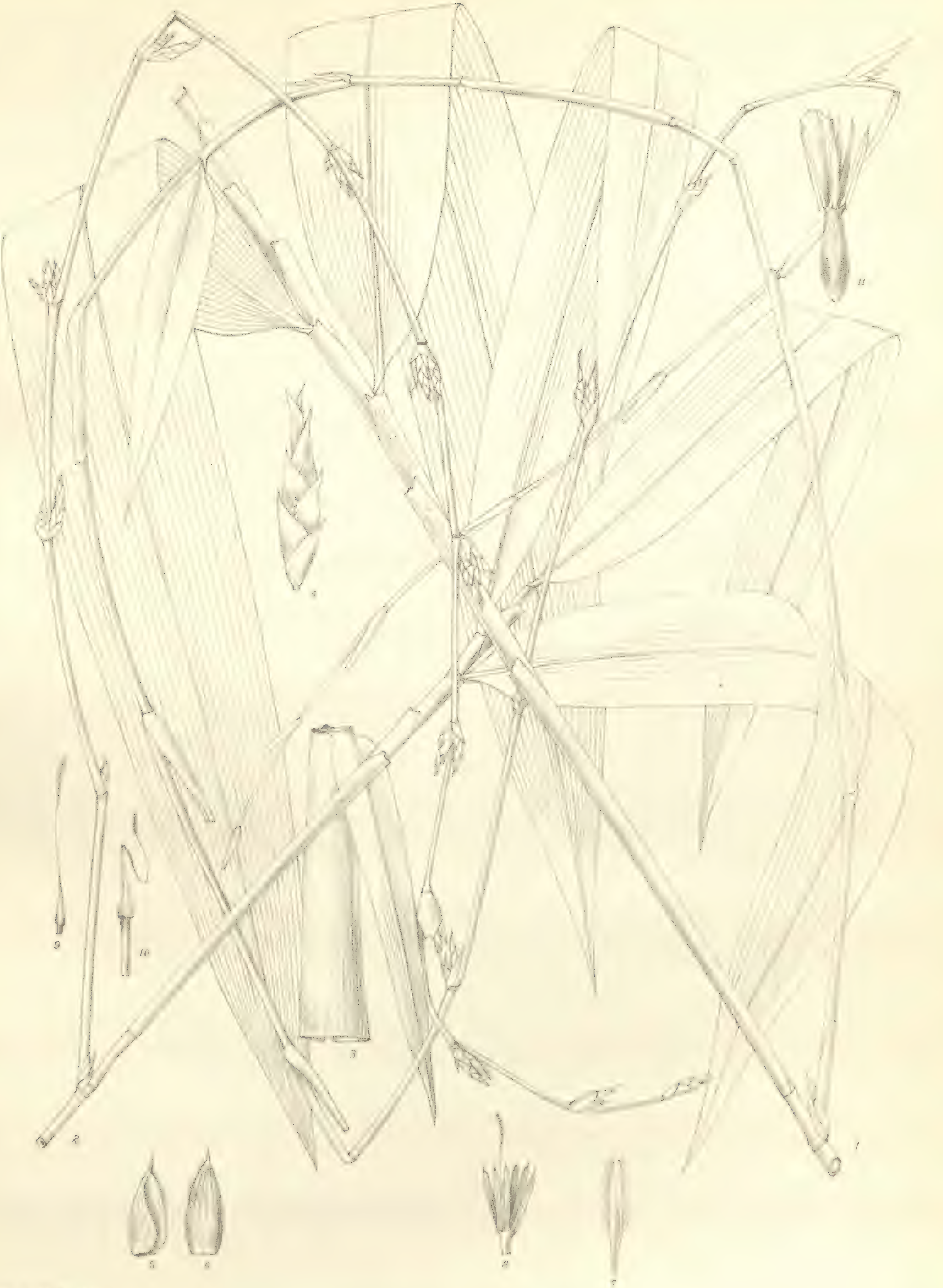
GIGANTOCHLOA MACROSTACHYA, Kurz.

Lith. by D. N. Chowdhury.

Drawn by G. C. Dass

Lith. by A. L. Singh

GIGANTOCHLOA WRAYI, Gamble.



Drawn by M. Dass.

Lith by K. P. Dass.

GIGANTOCHLOA KURZII, Gamble.

Drawn by M. [illegible]

GIGANTOCHLOA HETEROSTACHYA, Munro.

Lith: by D. N. Chowdhury.

Ann. Roy. Bot. Garden, Calcutta, Vol. 7, PLATE 58.

Lith. by A. D. Molia.

GIGANTOCHLOA LIGULATA, Gamble.

Drawn by

Lith: by A.L. Singh.

GIGANTOCHLOA LATISPICULATA, Gamble.

Drawn by M. Idrees.

OXYTENANTHERA NIGRO-CILIATA, Munro.

Lith. by K. P. Dass

OXYTENANTHERA ALBO-CILIATA, Munro.

Drawn by D. N. Choudhury.

Lith. by D. C. Ganguli.

OXYTENANTHERA SINUATA, Gamble.

Drawn by [illegible]

OXYTENANTHERA PARVIFOLIA, Brandis.

Lith. by [illegible]

Drawn by M. Idrees.

Lith by A. C. Chowdhary.

OXYTENANTHERA THWAITESII, Munro.

Drawn by M. Bose Lith: by K. P. Dass

OXYTENANTHERA MONOSTIGMA, Bedd.

Drawn by G. C. Dass.

Lith: by A. L. Singh.

OXYTENANTHERA STOCKSII, Munro.

Drawn by M. Idrees.

OXYTENANTHERA BOURDILLONI, Gamble.

Drawn by M. Idrees.

DENDROCALAMUS STRICTUS, Nees.

Lith. by S. C. Dass.

Drawn by M. Idrees.

DENDROCALAMUS STRICTUS, Nees.

Drawn by M. Idrees.

DENDROCALAMUS SERICEUS, Munro.

Lith. by D. N. Chowdhury.

Drawn by M. Idrees.

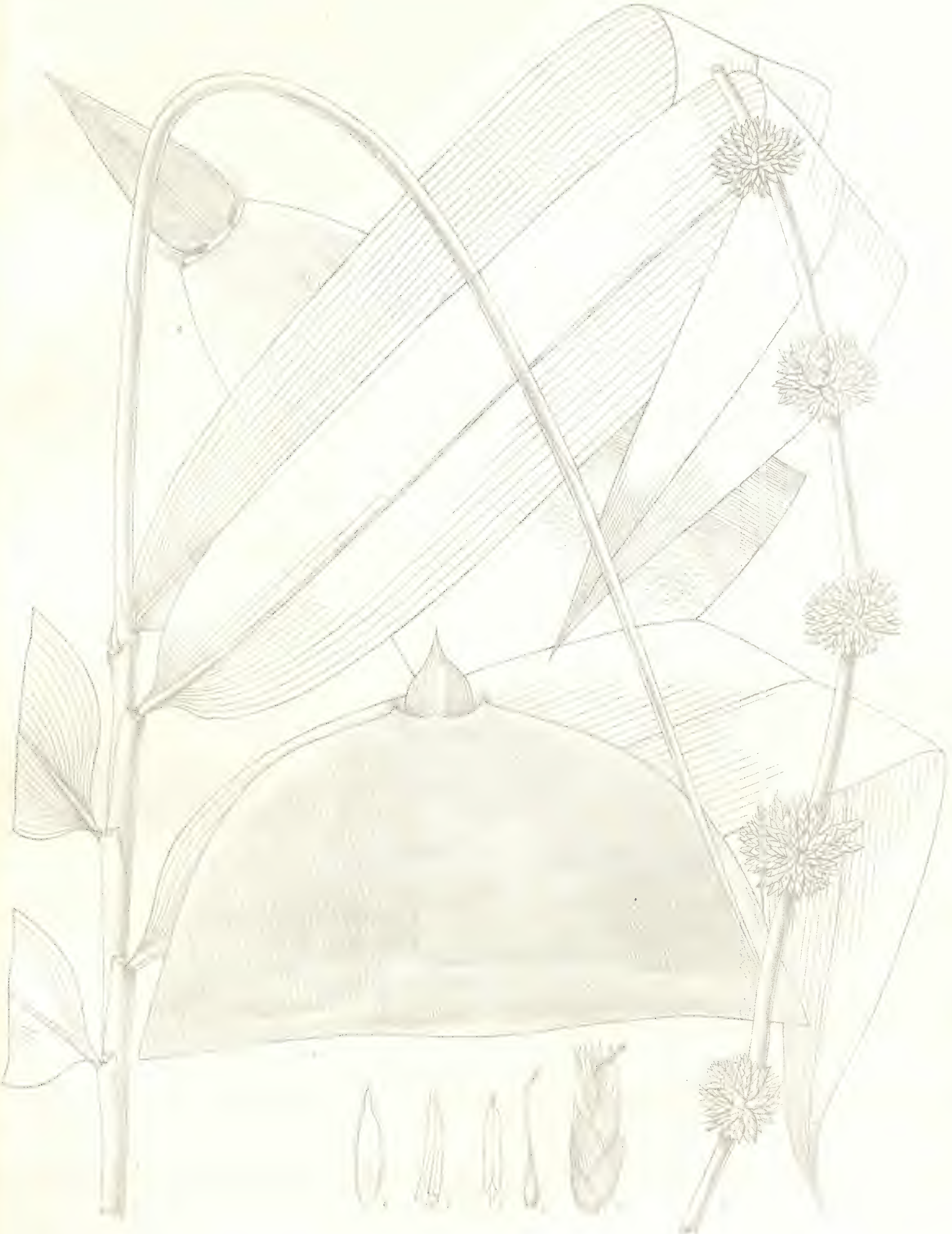
Lith: by G. C. Dass

DENDROCALAMUS MEMBRANACEUS, Munro.

Drawn by M. Idrees.

Lith. by A. L. [illegible]

DENDROCALAMUS SIKKIMENSIS, Gamble.



Drawn by M. Idrees.

Lith. by L. N. Chowdhury.

DENDROCALAMUS HOOKERI, Munro.

Drawn by M. Idrees.

Lith: by A. L. Singh.

DENDROCALAMUS HAMILTONII, Nees and Arw.

Drawn by M. Idrees.

Lith. by A. Singh

DENDROCALAMUS PATELLARIS, Gamble.

Drawn by D. N. Chowdhury.

DENDROCALAMUS GIGANTEUS, Munro.

Lith: by K. P. Dass.

Drawn by M. Idrees.

Lith: by G. C. Dass.

DENDROCALAMUS CALOSTACHYUS, Kurz.

Drawn by M. [illegible]

Lith: by G. C. Dass

DENDROCALAMUS LONGISPATHUS, Kurz.

Drawn by K. P. Dass. Lith: by K. P. Dass

DENDROCALAMUS BRANDISII, Kurz.

Drawn by A. J. Singh

Lith: by D. N. Chowdhury.

DENDROCALAMUS FLAGELLIFER, Munro.

Drawn by Hernasji.

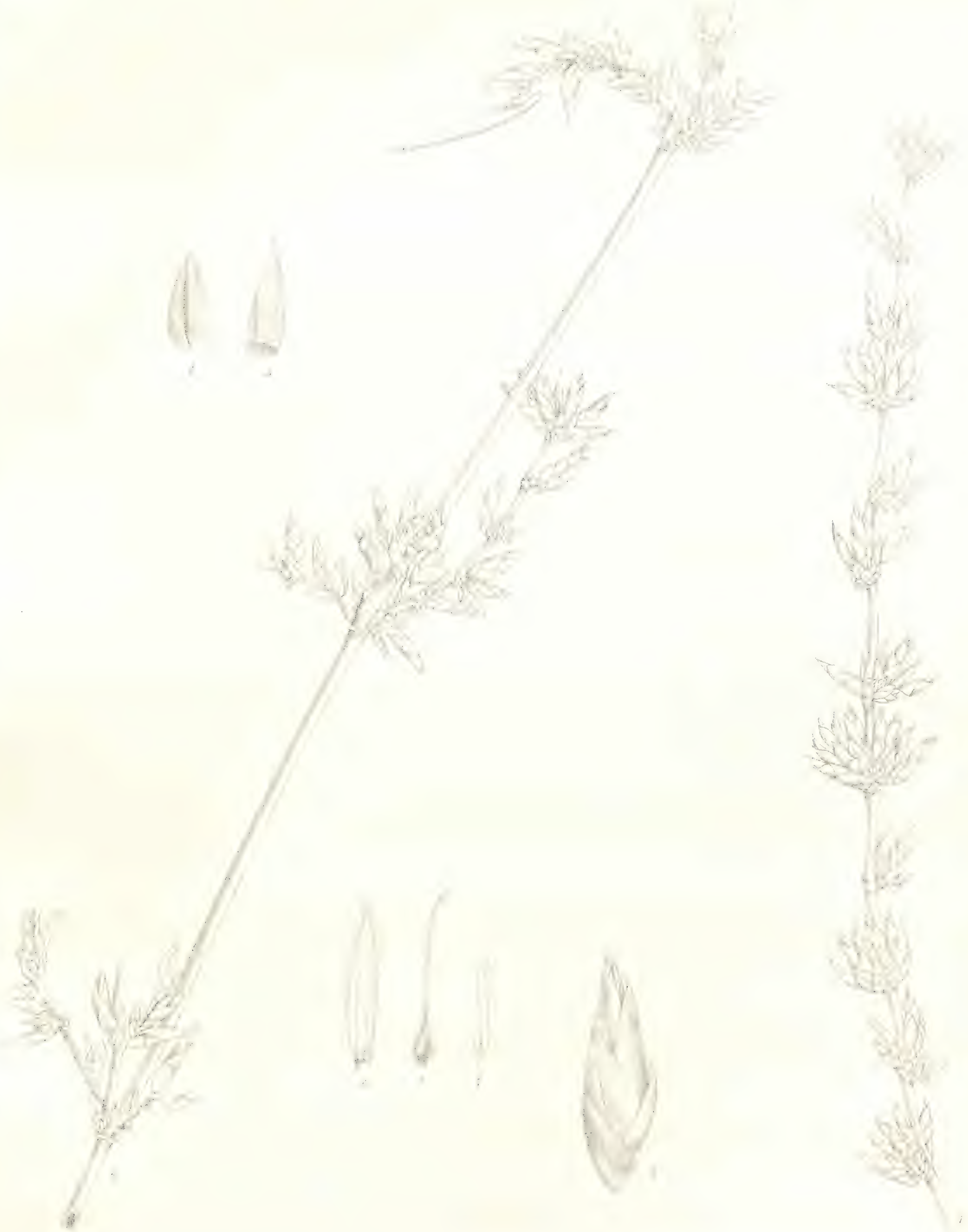
DENDROCALAMUS LONGIFIMBRIATUS, Gamble.

Lith. by D. N. Chowdhury.

Drawn by K. P. Dass.

DENDROCALAMUS PARISHII, Munro.

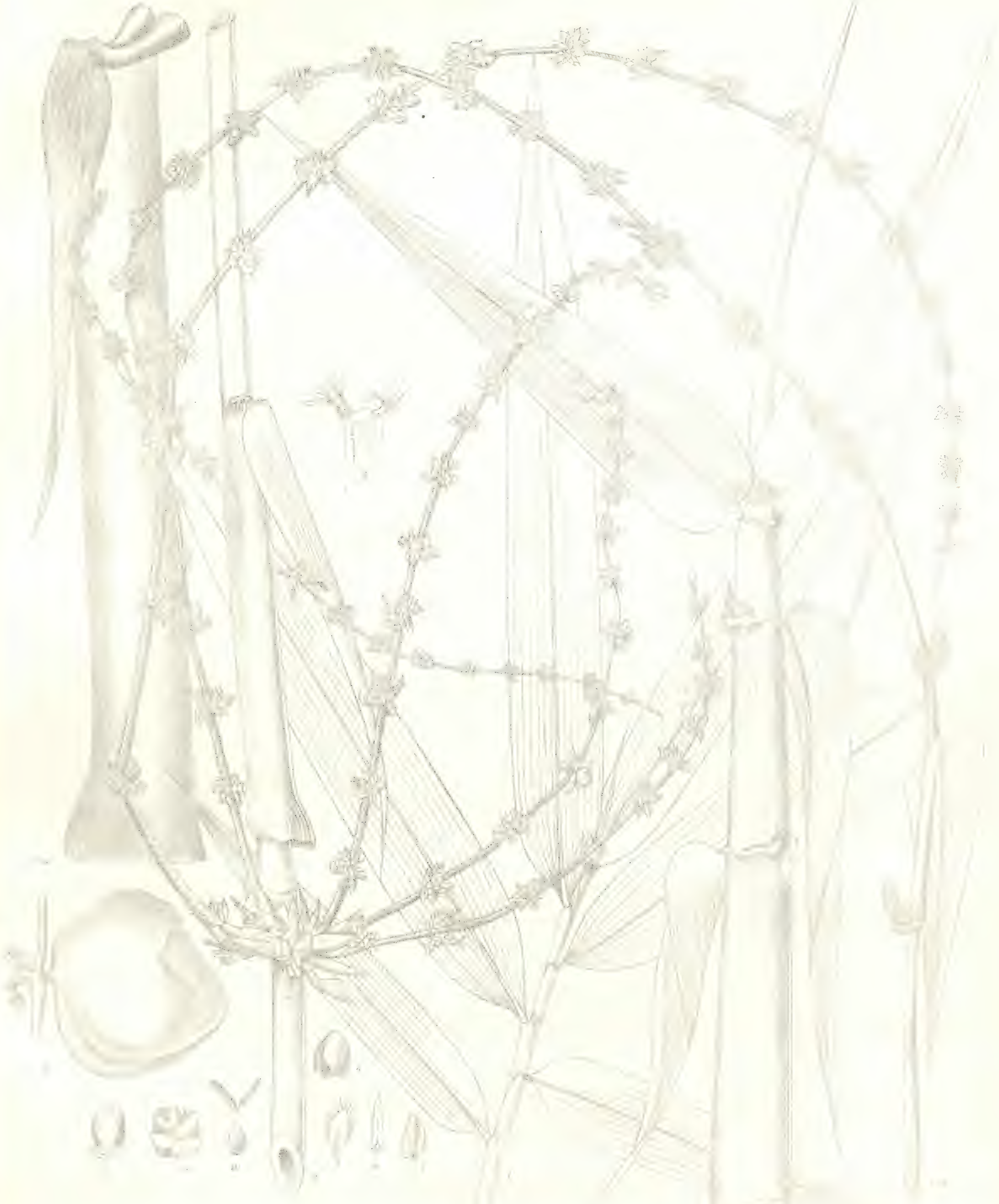
Lith: by K. P. Dass.



Drawn by B. P. Dass.

Lith. by A. L. Singh.

DENDROCALAMUS COLLETTIANUS, Gamble.



Drawn by M. Idrees.

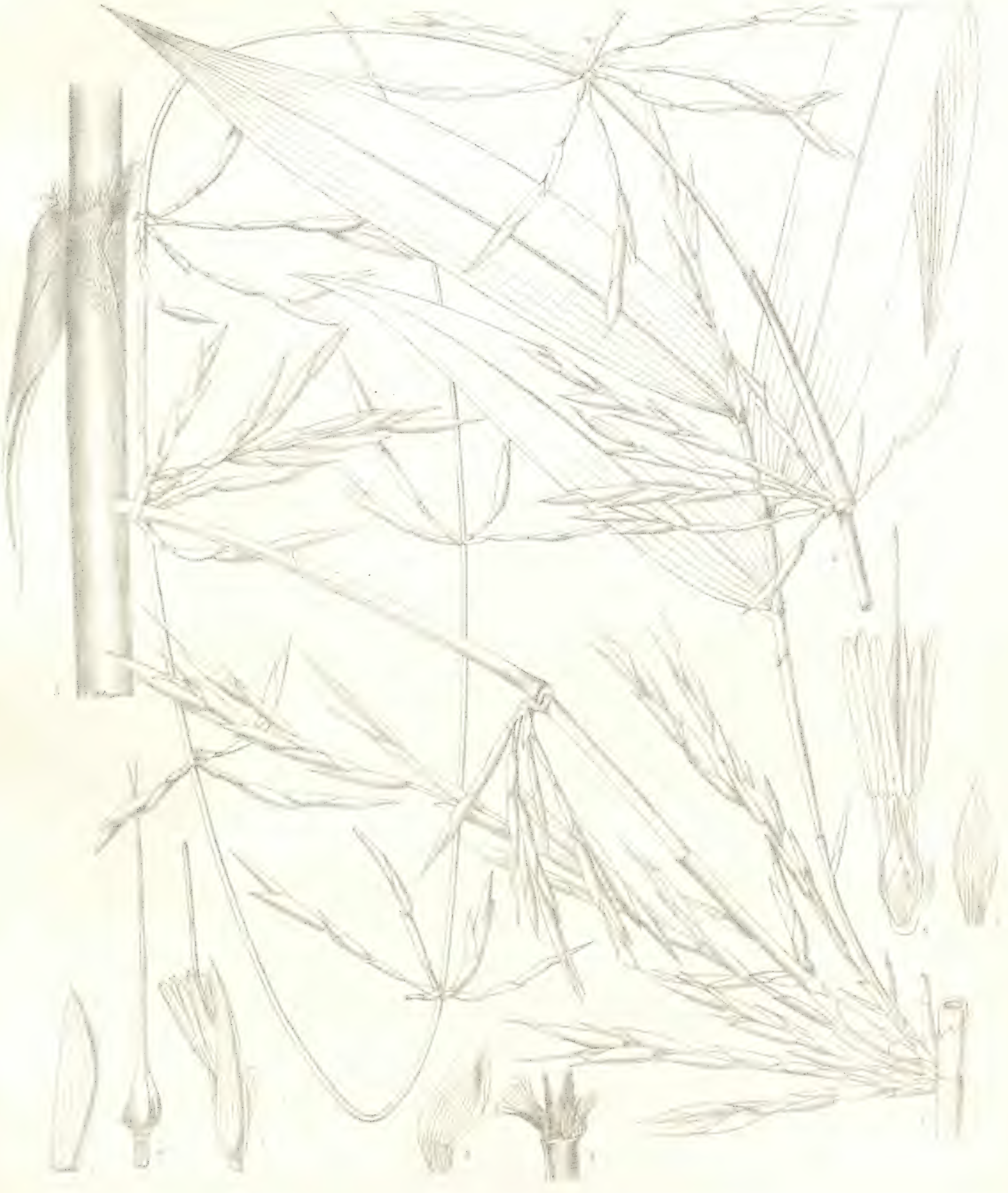
Lith. by A. L. Singh.

MELOCALAMUS COMPACTIFLORUS, Bth. and Hook. f.

Drawn by M. Idrees.

Lith: by A. L. Singh.

PSEUDOSTACHYUM POLYMORPHUM, Munro.



Drawn by M. Idrees.

Lith. by D. N. Chowdhury.

TEINOSTACHYUM GRIFFITHII, Munro.

TEINOSTACHYUM WIGHTII, Beddome.

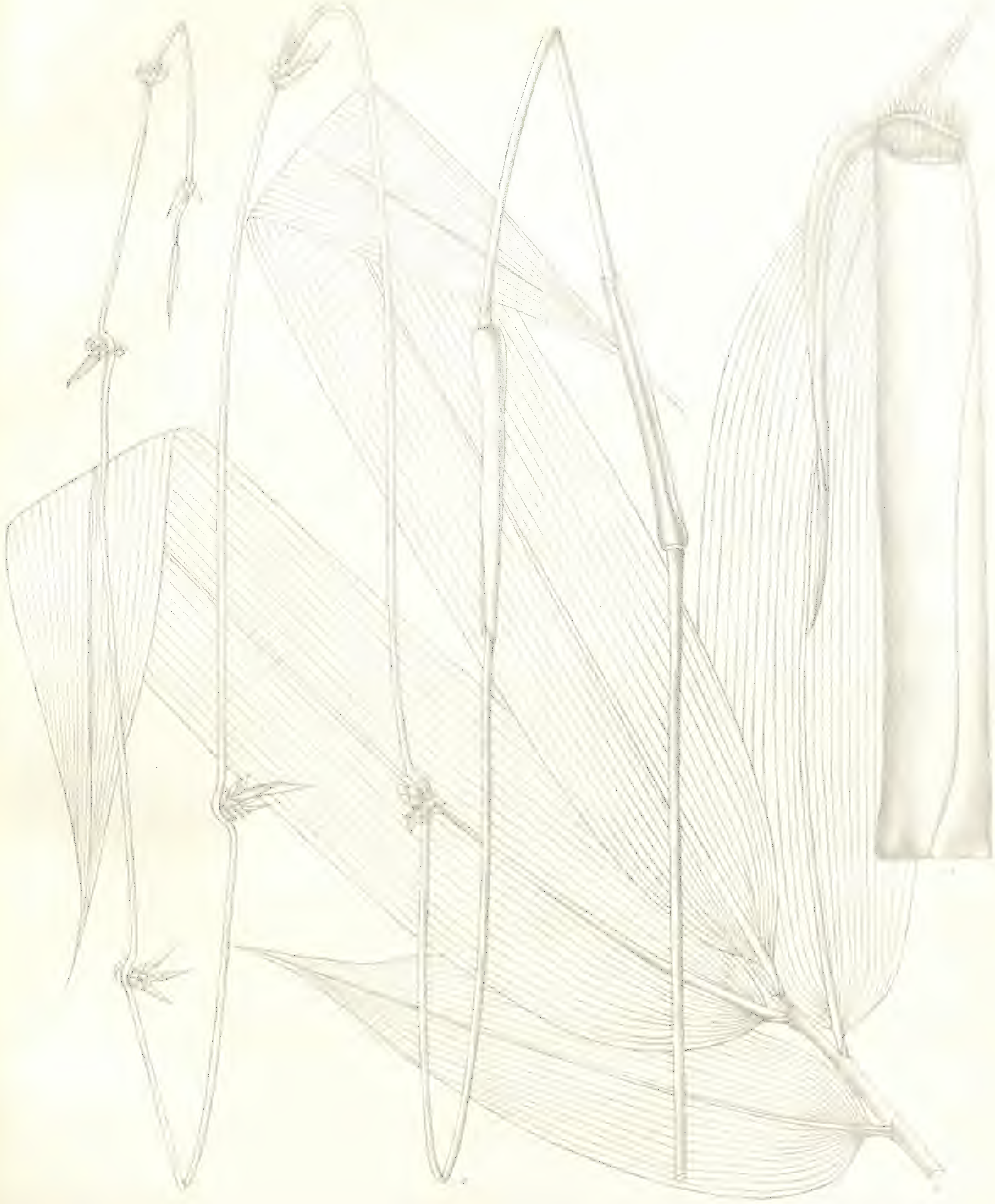
Drawn by M. Idrees.

Lith: by G. C. Dass.

TEINOSTACHYUM ATTENUATUM, Munro.

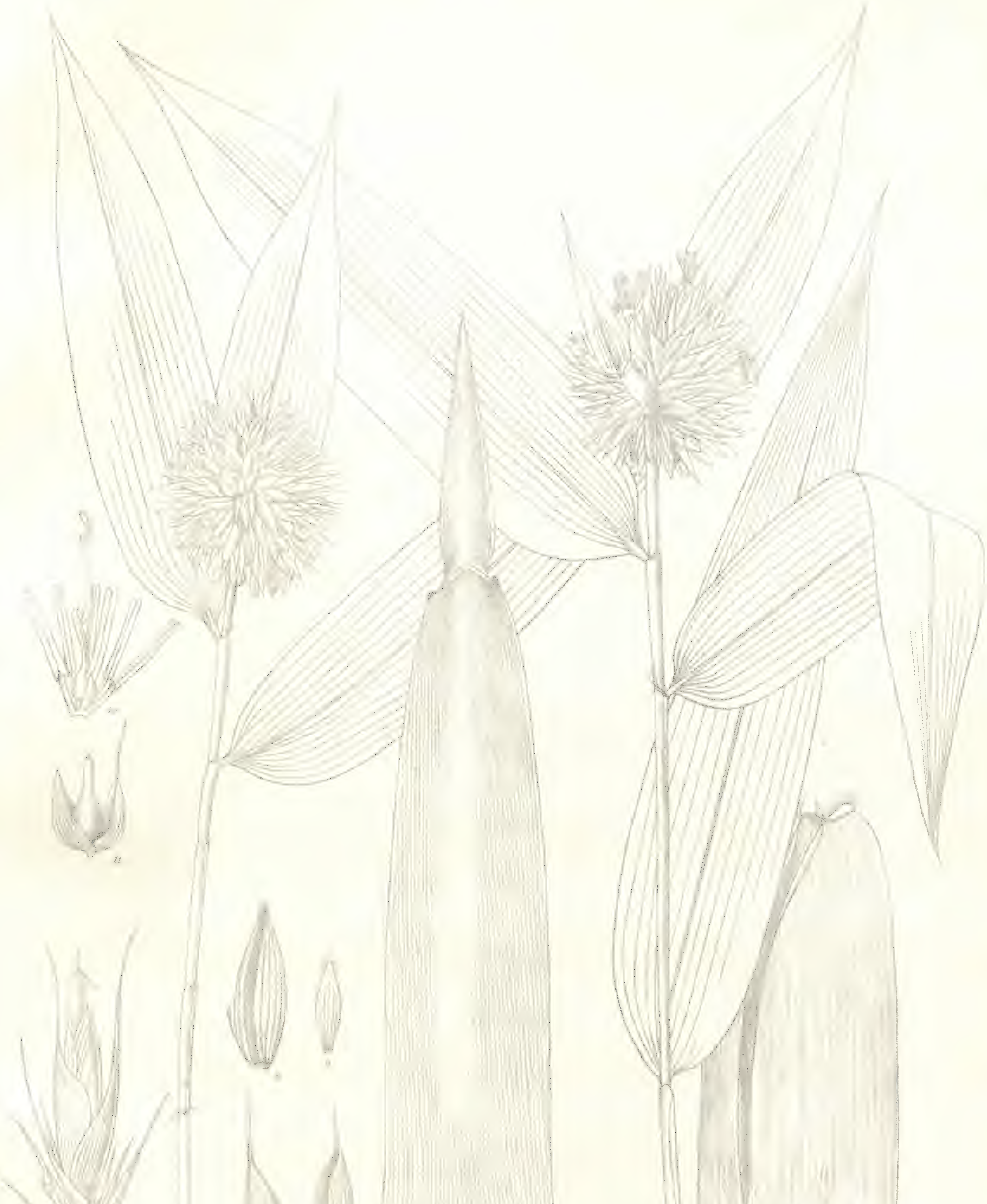
Lith. by A. L. Singh.

TEINOSTACHYUM DULLOOA, Gamble.



Drawn by A. D. Molla. Lith: by A. L. Singh.

TEINOSTACHYUM HELFERI, Gamble.



Drawn by M. Idrees.

Lith: by A. L.

CEPHALOSTACHYUM CAPITATUM, Munro.

Drawn by M. [illegible]

Lith: by K. P. Dass.

CEPHALOSTACHYUM PALLIDUM, Munro.

Drawn by M. Idrees.

CEPHALOSTACHYUM LATIFOLIUM, Munro.

Drawn by G. C. Dass.

CEPHALOSTACHYUM FUCHSIANUM, Gamble.

Lith. by K. P. Dass

Drawn by M. Idrees.

CEPHALOSTACHYUM PERGRACILE, Munro

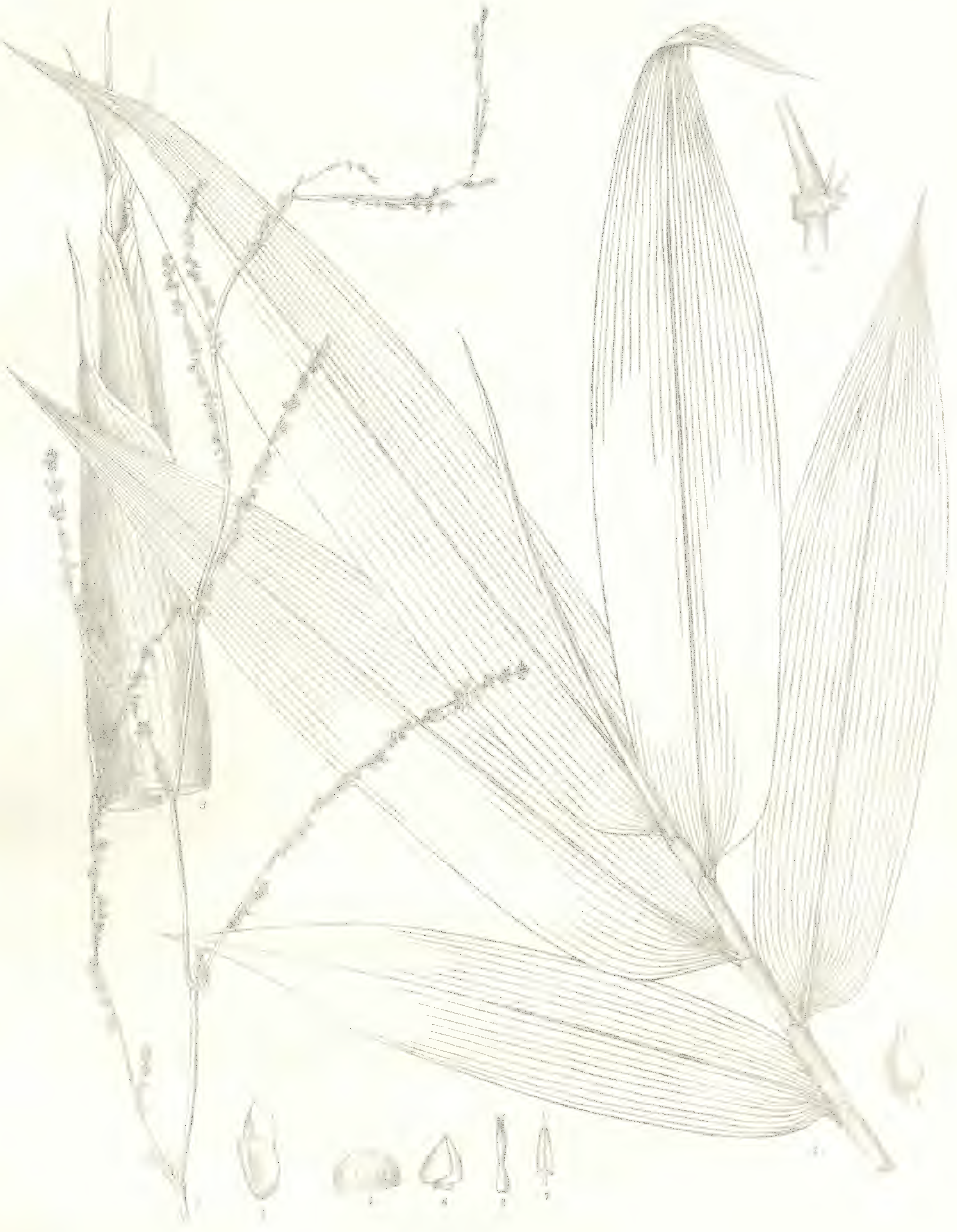
Drawn by [illegible]

EPHAL[illegible] [illegible]IUM [illegible]WI[illegible] C[illegible]NS, Kurz.

Drawn by G. C. Dass.

Lith: by A. L. Singh.

CEPHALOSTACHYUM VIRGATUM, Kurz.



Drawn by M. Idrees.

Lith. by A. ...

DINOCHLOA TJANKORREH, Büse. var. ANDAMANICA.

Drawn by K. P. Dass.

DINOCHLOA M'CLELLANDI, Gamble.

[illegible]

...OSTACHYUM ...ENUE, Gamble.

Lith. by ... C. Das.

Drawn by G. C. Dass.

SCHIZOSTACHYUM CHILIANTHUM, Kurz.

Drawn by D. N. Chowdhury.

SCHIZOSTACHYUM BLUMEI, Nees ab. Eseub.

Lith: by A. L. Singh.

Drawn by A. D. Molla.

Lith: by A. L. Singh

SCHIZOSTACHYUM LATIFOLIUM, Gamble.

Drawn by A. L. Singh.

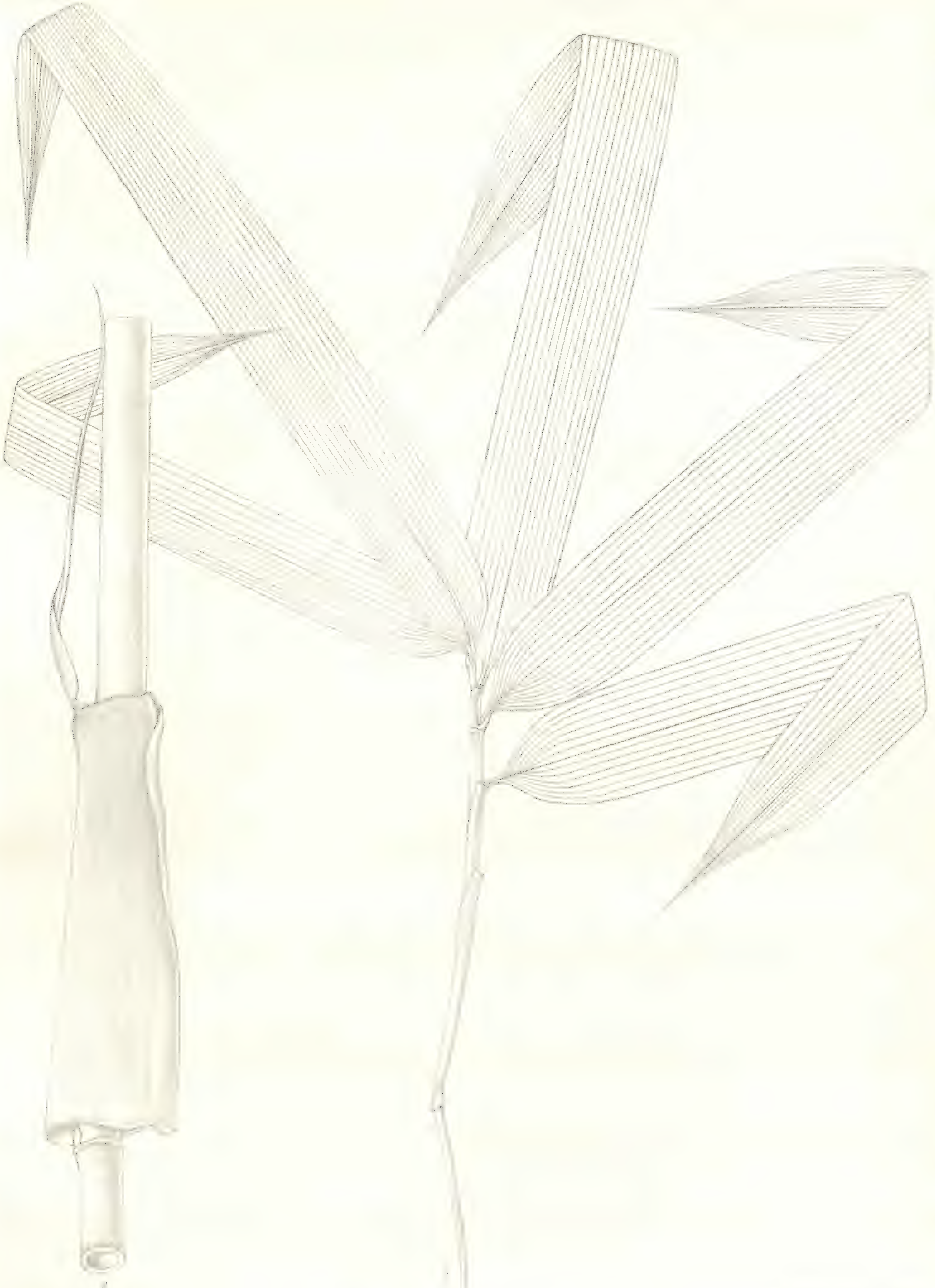
Lith. by K. P. Dass.

SCHIZOSTACHYUM ACICULARE, Gamble.

Drawn by M. Idrees.

MELOCANNA BAMBUSÆOIDES, Trin.

Lith. by K. P. Dass.



Drawn by A. L. Singh.

MELOCANNA HUMILIS, Kurz.

Drawn by M. Idrees.

OCHLANDRA RHEEDII, Bth. and Hook. f.

Ann. Roy. Bot. Garden, Calcutta, Vol. 7, PLATE 108.

Drawn by K. P. Dass.

OCHLANDRA RHEEDII, var. SIVAGIRIANA, Gamble.

Lith. by K. P. Dass.

Drawn by M. Idrees. [illegible]

OCHLANDRA STRIDULA, Thwaites.

OCHLANDRA BEDDOMEI, Gamble.

Ann. Roy. Bot. Garden, Calcutta, Vol. 7, PLATE III.

Drawn by M. [illegible]

OCHLANDRA TRAVANCORICA, Bth. and Hook. f.

Lith: by D. N. Chowdhury.

Drawn by M. Idrees.

OCHLANDRA TRAVANCORICA, VAR. HIRSUTA.

Drawn by K. P. Dass.

OCHLANDRA BRANDISII, Gamble.

Lith: by D. N. Chowdhury.

Ann. Roy. Bot. Garden, Calcutta, Vol. 7, PLATE [illegible]

Drawn by G. C. Dass.

OCHLANDRA RIDLEYI, Gamble.

Lith: by [illegible] Dass.

Drawn by C. C. Dass.

Lith by D. N. Chowdhury

OCHLANDRA SETIGERA, Gamble.

Drawn by A. L. Singh.

BAMBUSA OLIVERIANA, Gamble.

Lith: by G. C. Dass.

Drawn by K. P. Dass.

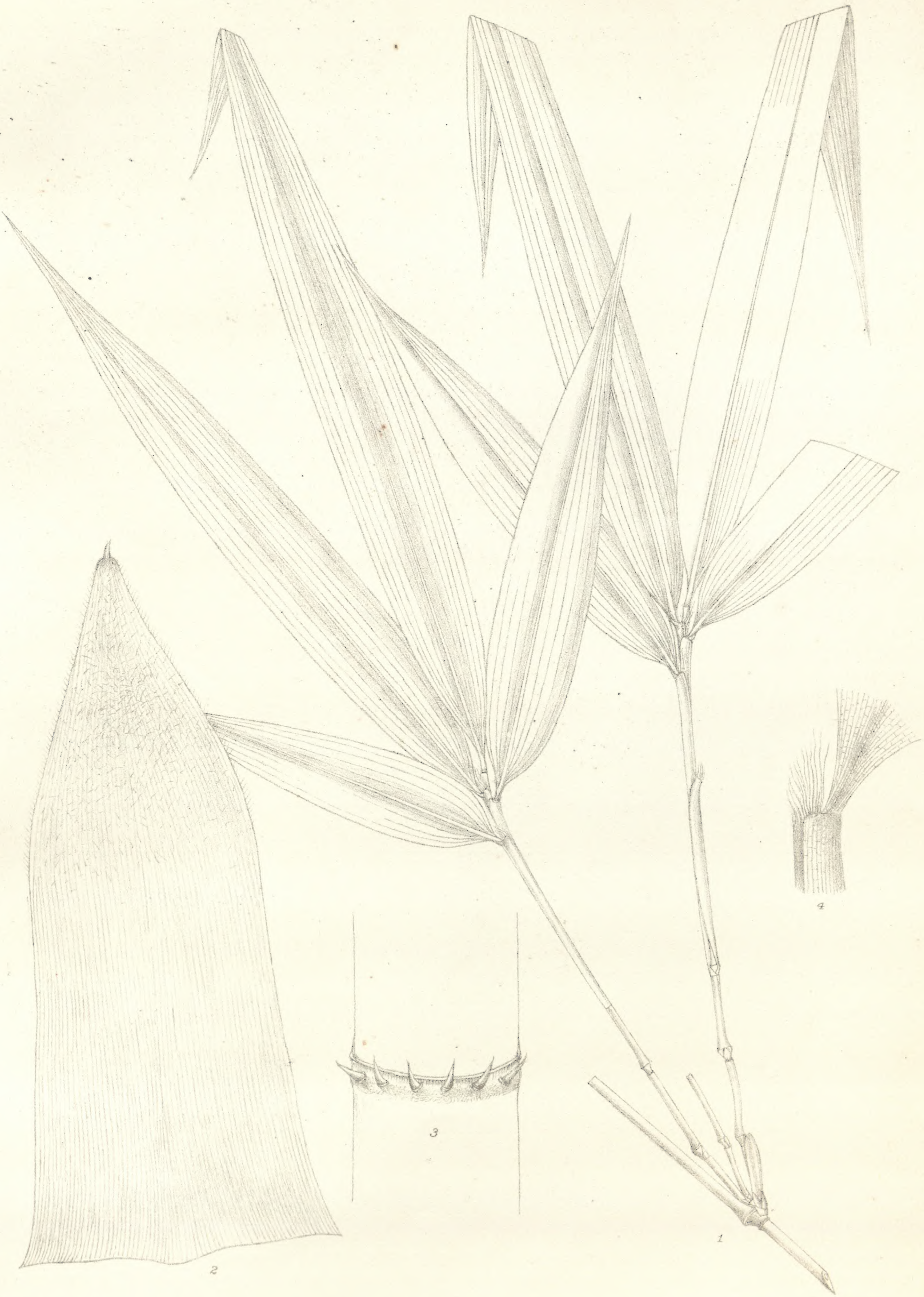
DENDROCALAMUS LATIFLORUS, Munro.

Lith. by K. P. Dass.

Drawn by A. L. Singh.

ARUNDINARIA PANTLINGII, Gamble.

Lith: by A. L. Singh.



Drawn by A. D. Molla.

Lith: by D. N. Chowdhury.

ARUNDINARIA ARMATA, Gamble.